THE IRON TRADE REVIEW

VOLUME XXIII. CLEVELAND, O., OCTOBER 30, 1890. NUMBER 44.

THE IRON TRADE REVIEW.

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS
IS PUBLISHED EVERY THURSDAY BY THE
CLEVELAND PRINTING AND PUBLISHING CO.,
Corner St. Clair and Wood Streets, Cleveland, O.

TERMS, (strictly in advance):

One year.....$3 00
Six months.....1 50
Three months.....75

Advertising Rates Furnished on Application.

ENTERED AT THE POSTOFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

CLEVELAND, O., OCTOBER 30, 1890.

THE WEEK IN IRON CIRCLES.

General Features. The position of wheat is not the least important factor affecting the general business situation. According to the best estimates, the visible supply on the 1st of next January will not reach what it was on January 1st, 1887, by say 63,000,000 bushels. The visible supply on land and sea has heavily decreased since harvest, and is now 2,000,000 bushels less than at this date a year ago. A shortage of 100,000,000 bushels exists in the Mississippi Valley, and as the outward movement from New York is now about 1,000,000 bushels per week, the diminution of the supply is quite appreciable. Great Britain and the continent are bare of good wheat, their samples selling from five to twenty cents less than our contract grades. Indian and Russian shipments recently show a falling off; the Australian and La Platte shipments aggregate 157 vessels against 51, for the three months ending September 30th. Turning to the iron market we find that the statistical position of pig iron is a strong one, and is recognized as such by both furnaces and buyers, the latter of whom have given evidence of their convictions by special inquiries and larger purchases during the past few days. As usual, however, during a period immediately preceding a higher market several weak spots have been developed, and several large orders have been reported as placed at very low prices. The conditions which make such sales possible, however, are in themselves installable and are foreign to the forces which govern the market. Southern furnaces, which recently advanced prices, were all well fortified for such action, being well sold ahead on almost all grades, and in one case, on No. 2 foundry no further sales can be made until next February, the entire output of the stacks having been contracted for up to that time. The decrease in stocks at furnace yards during September is even greater than it was at first reported, and all the consumers throughout the country are melting iron largely. Prices of finished iron are relatively higher than pig, and an adjustment will naturally follow by an advance in the pig metal rather than a reduction in prices of the manufacturer's product. In the Chicago market Southern coke irons have displayed a decided tendency towards higher prices, several leading furnaces having advanced figures twenty-five cents per ton and report a liberal supply of orders on hand. Demand seems to be chiefiy for this class of iron and lake ore mix cokes, heavy sales of these having been made, also of Southern charcoal and silvery grey. While there has been considerable activity shown during the past week at Detroit, sales have been generally of limited amounts ranging from single car loads up to 100 tons, and in a few instances of larger quantities. A number of inquiries for round lots of Lake Superior charcoal have been received from entirely different localities, and furnaces were compelled to decline to quote, as it would be imposible to make deliveries wanted. It was generally supposed that the larger buyers of this quality had all made their purchases for this season, but the inquiries would go to show that such is not the case. There seems to be a general short supply of foundry irons in consumers' yards, and they are asking to have shipments hurried forward, and in a majority of cases deliveries are wanted faster than specified at time orders were given. At St Louis inquiry has been active, during the week, for small and medium lots, affecting principally Southern coke irons.

Iron Ore. Now, that the remainder of the shipping season is to be counted by days, the result of the Summer's work can be more accurately estimated, and it is safe to say that the estimate made in this column, with a forecast of 7,800,000 tons, was not far out of the way. These figures, of course, have reference, to lake shipments only. Inquiry among the vessel agents develops the result that a trifle less than 10 per cent of the total lake tonnage went wild during the entire season, and with hardly an exception this portion of the fleet will be out of commission by the end of this week, thus saving the carrying charges of an unprofitable season, and obtaining a rebate of 20 per cent. on their insurance. Of the remaining tonnage, the staunchest boats will be kept running as long as possible, as some producers are yet considerably short of their sales: but most of the wooden boats will be laid up by the middle of next month, whereby 10 per cent. of lake insurance may be saved. The total shipments to date approximate 7,200,000 tons, and allowing another 600,000 tons for November—which is a liberal estimate—the figures above indicated will just be about reached. There is still a large demand for standard ores, both from the Central West and from Eastern furnaces, the latter appearing to be in need of Bessemer ores. In the opinion of competent persons a fairly low railway tariff would bring about all-rail Winter shipments of Bessemer ores amounting to fully a million tons. As it is, the demands made on the furnaces is rapidly clearing away the ore from receiving points all along the lower lakes, and the docks, by the first of next month, will show a great decrease in stocks over preceding seasons.

Pig Iron. The grim humor of the gloomy situation is responsible for the expression on the part of a large furnace representative that "both stocks and prices are getting lower," and the facts seem to "bear" out this statement. Bessemer goes at $16.50 and $16.75, cash, at Valley furnaces, with a prime quality of foundry iron at $16. No. 2 foundry sells at a dollar less, and forge iron can be bought for $14 on the same basis. It is safe to say that the only difference between the various furnace concerns is the difference in their losses, for every one of them is running at a loss, varying only in amount. In the meantime the coke barons are quietly pocketing $2.15 a ton for their product. That price, it should be remembered, was made on a basis of $22 for Bessemer iron, but it is still in force, although Bessemer has lost five dollars and a half since the price was made. This action on the part of the coke producers means the strengthening of competition against the Western iron market, and benefits the Southern trade directly. The furnaces hereabouts are compelled to run, even at a loss; some because of their fixed charges, some because of fear that they might lose their customers, and others because their ore payments must be met somehow. A reduction in the price of coke would mean a great easement in these times of narrow margins, but the coke combination is firm, thus playing directly into the hands of a competition which cannot possibly benefit the coke trade, because the Southern furnaces coke their own coal. The inevitable result means much more to the Western furnaces than temporary loss, since it brings Southern irons more closely into this market, and gives it a standing which is likely to prove permanent. The consequent loss to the coke trade is so obvious that it requires no comment, and the combination is fast killing the historic bird that lays the golden egg.

Merchant Iron. The mills are running day and night to fill the multitude of their orders, but there seems to be not the least falling off in the usual activity of the market in all its branches. Billets are rather low, but bar iron, sheets, and all manner of structural iron are firm and high. Muck bar particularly is in strong demand, and is correspondingly scarce. The hardware trade reports a booming business and in many lines stocks are reported to be broken. Nails, both cut and wire, are doing well, and metals are strong.

EFFECT OF THE NEW TARIFF IN FOREIGN TRADE.

The effect of the new American tariff on the British iron and steel trades, is the subject of an elaborate and intelligent editorial article by the *Colliery Guardian*, of London. Our London contemporary rightly divines that "the aim of the American manufacturers," and, indeed, the American people, "undoubtedly is to so manipulate matters that they shall be called upon to supply every ton of iron and steel that is required within the United States, and that British producers shall be prevented making their country the principal market for metals of British origin." That is about the size of it, though it may be observed that the prime object of tariff is not especially to antagonize British manufacturers so much as to build up American industries. The *Guardian* calls attention to the fact that British exports of iron and steel to the United States thus far this year have been but a little more than one-third of what they were in the corresponding period of 1887, but it claims at the same time that new markets had supplied the decreased consumption of British products in the United States.

As regards pig iron, while the new tariff will not directly affect it except to steadily continue the decline in British exports to the United States, it will, nevertheless, indirectly have a detrimental effect upon the pig iron industry of Cleveland, Cumberland and South Wales, because of the decline in demand for Welsh tinplates. Indeed, the tinplate and cotton tie industries will be the hardest hit of all the British industries. "With such a duty as 2.2 cents per pound," says the *Guardian*, "we may expect to see tinplate manufactories springing up quickly in the United States, and that will naturally tell disastrously upon our own manufactories, for two-thirds of the tinplates made in this country are for the American market, and if the United States ironmakers bring about the effect at which they are aiming then there is no doubt that half to two-thirds of our tinplate factories may be shut up, and our total shipments of iron and steel to the States will be small indeed, for out of a total of 399,234 tons sent this year so far, 227,114 tons were in the form of tinplates."

As to cotton ties, the *Guardian* says that Staffordshire will bear the brunt of the loss of American trade, by reason of the new duty on that article. As a whole, the outlook is not particularly hopeful for these two giant industries, and it is not strange that manufacturers across the water should regard the new order of things with something akin to dismay.

PROTECTION IN CANADA.

No more vigorous business organization exists in Canada than the Canadian Manufacturers' Association. With Mr. Bennett Rosamond at the head and Messrs. Frederic Nicholls and J. J. Cassidy as secretaries, and with the able backing of the enterprising *Canadian Manufacturer* (which, by the way, ought to be published weekly, rather than fortnightly), the Association has been doing yoeman's service in behalf of Protection in the Dominion. The annual addresses of the two secretaries, just at hand, show that the executive officers are ever alive to the interests of Canada and the Canadians. On the beautifully illuminated cover which encloses the addresses are such appropriate mottoes as these:

"Breathes there a man with soul so dead,
Who never to himself hath said,
This is my own—my Native Land."
—*Scott.*

"You must not think that we are made of
Stuff so flat and dull that we can let our beard be
Shorn with danger and think it pastime."
—*Shakespeare.*

"Such is the Patriot's boast where'er he roam,
His first, best country, ever is at home."
—*Goldsmith.*

"A country that manufactures for itself prospers."

"The more a country produces the richer it is."

The object of the addresses appears to be to rally the friends of the National Policy to a renewed effort to resist the tide that seems setting toward Reciprocity and its twin-sister, Annexation. The effect of the Sherman resolution is, it is claimed, to encourage the annexation movement, and the success of the Liberal party in the impending elections would mean a distinct offer on the part of Canada to accept overtures from the United States. As to the present political outlook in Canada Mr. Nicholls says:

We are informed by the Independent press that, on the occasion of the next general election, will be witnessed a most determined attack on the National Policy, and a reason for such forecast readily suggests itself. The Free Trade opposition at the last general election assured the Protectionists that no serious interference with the tariff would ensue in the event of their success. In the light of subsequent events they considered that this insincere pledge was impolitic; and as Napoleon, at Waterloo, in a last vain and despairing effort ordered the Old Guard to advance and save the day—if they could—so it has been determined by the opposition to mass the remaining Free Trade legions for a last and final rally. Are they likely to be successful? Yes; if our sentinels are found asleep on duty, and our army is intoxicated with the victories already won; but if our advance guard is on the *qui vive* and the grand army of Protectionists and all the reserves are standing shoulder to shoulder, ready for the signal to advance in the formation which has hitherto been found invincible, another decisive victory for Protection will undoubtedly be recorded.

It cannot be denied that the consistency of the argument is with the Canadian Protectionists. It has, indeed, always appeared strange to us that the Liberal party of Canada should put itself in the attitude of antagonizing Canadian interests; and whatever our opinions of the Tory party as such, we cannot but admire its vigor, its consistency, and its far-seeing wisdom in adopting and defending the system of Protection to Canadian Industries.

THE FUTURE OF THE RIVAL IRON AND STEEL MAKERS.

Mr. R. H. Thurston, Director of Sibley College, Cornell University, indulges in some attractive prophecies, in the course of a long article in the New York *Tribune*. He holds that, at the beginning of the twentieth century, the indications are, we shall be far in advance of any nation in the world in all that goes to make a nation materially prosperous. At that date Great Britain, he holds, will be making about 10,000,000 tons of iron and steel, and something over, and using in her own manufactures, for the benefit of her own population, something less than that amount; the United States will be making not less than 12,500,000 tons, very possibly 15,000,000, and using it all for her own people and in the promotion of her own welfare.

The conditions of such prestige, he claims, rest entirely with the people of the United States, and he puts these conditions as follows:

With sensible and practical management of our tariff and of our other industrial affairs; with a true tariff reform in steady and continuous operation; with a perfected Civil Service reform; with the extinction of "party-before-country" management; the reformation of our elective and legislative methods; with the prompt relegation of self-seekers, demagogues, and the "politician," as distinguished from the statesman, to the depths to which they belong; with the assumption of the reformation of the tariffs by practical and common sense men, familiar with industrial conditions as they exist; the reformation of the Civil Service by business men conversant with business methods; and with the managment of legislative and executive functions by patriots and statesmen, we may have wisdom, prudence, knowledge and tact, combined with courage and energy; and so see rapid progress toward all that good citizens hope for in the future of our country. Failing either, we shall fail of satisfactory advancement; failing all, we shall certainly wholly fail, even if we do not meet with greater dangers than have ever yet loomed before us, and with graver disasters than ever lack of wisdom, courage, prudence and patriotism yet brought upon any nation.

There can be no doubt that the drift of events during the past decade has been plainly in the direction indicated above. We have already passed Great Britain in the manufacture of steel, and can undoubtedly hold this lead in all other products of iron if we are not diverted from the path in which we have thus far followed.

THE LISTING OF INDUSTRIAL STOCKS.

There appears to be a well-defined movement in the East to induce the New York Stock Exchange to list first class industrial stocks. In support of this scheme attention is directed to the experience of Great Britain. In 1862 the British Parliament passed an act allowing corporate organizations for industrial purposes. Since the passage of the act of 1862 these corporate organizations have grown steadily in public favor. The following figures, compiled from the recent returns on this subject, issued by the House of Commons, will show the growth of the new companies in Great Britain from April, 1884, to April, 1890, and will also show what a firm hold that kind of investment has upon the country:

Year.	No. of Companies.	Paid up Capital at $4.85 to the £.
18 4	8 692	$1.306.423.775
1885	9 344	2,4 0,312,830
1886	9,471	2,558,742,767
1887	10,494	2,868,81 ,156
1888	11,001	2 965 437,299
1889	11,968	3,258,570,392
1890	13,323	3,759,426,832

It is not stated how much of the above amount represents industrial enterprises, but it is known that industrial enterprises rank high on London 'Change, because of their close scrutiny before listing. Just what effect speculation in the stocks of our leading industries would have the advocates of the scheme do not pretend to say, but

the listing of several millions of such securities would afford fresh fields for the operations of the now listless "bulls" and "bears" of Wall street, and that is what they are after.

ALL of our English exchanges unite in the opinion that the present visit of foreign iron and steel manufacturers will result in heavy investments of British capital in the United States. The controlling reason is a significant one, viz.: the passage of the McKinley bill.

THE aggregate attendance at the Pittsburgh Exposition this year was about 450,000, and the enterprise has made a nice profit in solid cash, aside from the general benefit to the people. The correct business management is what did it.

COMPLIMENTARY COMMENTS.

The Iron Trade Review has published a neat pamphlet giving the iron and steel schedule of the new tariff law, compared with the old, so that consumers can see exactly how much more or less they will have to pay for iron and steel under the new law.—[Cleveland Plain Dealer.

The Iron Trade Review, Cleveland's excellent iron journal, has prepared and sent out with its compliments a handsome pamphlet containing the iron and steel schedule of the new tariff law, together with a comparison with the old rates.—[Ohio Valley Manufacturer, Wheeling, W. Va.

The iron and steel schedule of the new tariff law, with comparison with the old rates, done up in neat pamphlet form, comes to us with the compliments of the enterprising *Iron Trade Review*, of Cleveland, O. It is a convenient and therefore useful shape for ready reference.—[National Labor Tribune, Pittsburgh.

The iron and steel schedule of the new tariff law in pamphlet form has been issued by *The Iron Trade Review*, of Cleveland. The little work is exceedingly handy for reference, just now when the points of difference between the old and the new tariff are so often being brought up, and in getting it out, one wide awake contemporary is, as usual, fully up to the times.—[American Manufacturer, Pittsburgh.

We are indebted to the courtesy of *The Iron Trade Review*, of Cleveland, for a neatly printed, compact schedule of the tariff rates imposed by the McKinley tariff law, as compared with previously existing rates.—[Financial and Mining Record, New York.

First Basic Steel Made in the South.

Benjamin Talbot, Superintendent, Chattanooga, Tenn., writes the *Engineering and Mining Journal*:

Our first run of basic Siemens steel was made from charcoal pig mixed with wrought iron and steel scrap. We are now running on white and mottled coke pig, which contains under 1 per cent. silicon, 1.30 per cent. phosphorus and .06 per cent. sulphur, and gives very good results. The analysis of the steel is all that can be desired, as we can bring the metaloids down to any limit that may be required. The following analysis is taken from one of our runs last week: Carbon, .08; silicon, trace; manganese, .46; sulphur, .03; phosphorus, .048. I have not had any of the metal in the testing machine yet, but have no doubt that steel of the above analysis will give a tensile strength of about 25 tons per square inch, reduction of area between 60 and 70 per cent., elongation in a length of ten inches about 30 per cent. Of course I could increase the tensile strength if required. With reference to my views on the subject, I never did regard the process in the light of an experiment, as we have had it at work too long in England not to know of its entire success. The iron here is not so difficult to work as what is used in other countries. There is not so much scrap to be obtained as one can desire, but that difficulty can be easily overcome by using desiliconized and partly decarbonized metal. It is my opinion that we shall see an enormous development of Southern industries during the next few years, owing to its being proved that steel of the very best quality can be made from Southern ores. Our steel is very suitable for the manufacture of boiler plates, sheets, tinplates, all kinds of shapes for engineers' requirements. If necessary we can also recarburize, and make the steel hard enough for rails, etc.

An Old Stove Plate.

A correspondent who has attended the Milwaukee Exposition sends us the following interesting information: "While sauntering through the Exposition, the other day, I came across an ancient stove plate, which, I learned from the inscription, was found in an old house in the village of Westerlede, Oldenburg, Germany. The plate is a very rough and unfinished specimen of the founder's art. Its side is taken up with a rude representation in bas-relief of the meeting of Christ and the woman at the well. At the bottom of the plate, and spaced so as to extend across it, is the date, 1630, in large, plain figures."

This is a very old stove plate, and well worthy of preservation. Germany was one of the first countries, if not the very first, to make stoves of cast iron. In the fifteenth century pots, plates, cannon balls and other articles of iron, many of them of great artistic excellence, were cast at the celebrated Ilsenberg foundry, in Germany, which is still in existence. Stoves are said to have been cast for the first time in Alsace in 1490. As early as 1509 they were cast at Ilsenberg. David Mushet quotes M. Verlit as stating that cast iron was known in Holland in the thirteenth century, and that stoves were cast from it at Elass in the year 1400. England does not appear to have made any articles of cast iron before the sixteenth century.—[Bulletin of the American Iron and Steel Association.

FUTURE STEEL CENTERS.

The visit of the British iron and steel visitors to the iron manufacturing district of Birmingham, Ala., was an interesting one, not only to that section, but to Pittsburgh, which has kept a kindly watch on that district, not so much as a present rival, as an infant which may in time become one. The reports state that all the speakers united in declaring that good basic steel could be made there as cheaply as in any district in the world, and Sir Lowthian Bell repeated his prediction of 1874 that Birmingham would become the point of cheapest iron production in the Union, which he considers already realized.

These assertions, made by authorities of such standing, are, of course, extremely encouraging to the Alabama interests, and must be taken to indicate the direction of their greatest growth. Heretofore the complete success of the Alabama iron industry has been hampered by the unsatisfactory results of their efforts to produce iron fit for the Bessemer process. The declarations quoted are to be taken as a corroboration of what has been intimated before, that the basic process affords the Alabama region the most available method of converting her mineral deposits into steel, and that with the adoption of that process, the future erection of a great steel manufacturing center there is to be taken as a settled thing.

Pittsburgh can recognize this fact frankly and without jealousy. The experience, skill and muscle which our city has sent to that district has been no mean contribution to its growth in that direction. But because we recognize that our Southern neighbors have before them the brilliant prospect of becoming competitors to Pittsburgh's steel products, that is no reason why we must concede that even at some distant point in the future the supremacy will be transferred. On the contrary, the recognition of the important part which basic steel is to play in creating a competitor, only points out to Pittsburgh the way in which she must fortify her position by enlarging her plants for that class of manufacture as energetically as she has done with the Bessemer and open-hearth processes. Pittsburgh has within easy reach immense supplies of ore suitable for the basic process, and by taking the steps necessary to make them tributary to her works she can maintain her leadership in the manufacture of steel in the future as decidedly as in the past.

Our city need not depreciate or refuse to recognize the progress of a possible rival in the domestic production of steel. But when the factors which promise to create that rival can also be made to strengthen the industries of Pittsburgh, the fact is worth careful attention.—[Pittsburgh Dispatch.

Corrosion of Iron in South American Climate.

A correspondent of *Engineering* recently described the delights (?) of railroading on the west coast of South America, and made the following remarks on the durability of iron in that climate: A piece of wrought iron left in the open air all night will be found next morning covered over with globules of water of a dull yellow color, this color being due to the presence of oxide of iron. On wiping these away a small pit will be found in the iron where each drop of water has rested. A thick coat of good paint will be eaten through in this way in two nights' exposure. Wooden sleepers that have been in use for nearly 20 years, are as sound as when first put down, while in some places the flanges of the rails resting upon them have completely disappeared. It is impossible to keep steel or iron work bright, even a bunch of keys or the blades of a knife in constant use become quite rusty in a few days. Iron that has been galvanized fares no better. From a perfectly new wrought iron water pipe was cut a piece 8 in. long in which there were a dozen holes after it had been in use no less than a week. It was used for feeding sea water into the condenser boiler against about 50 lbs. pressure. In this case the iron was of the most wretched possible description. The pipes had obviously been made expressly "for export." Good iron, is, however, much more durable. For instance, we cut from a longitudinal boiler stay, a piece 10 inches long which had received five complete twists before it broke. In this sample, although deeply grooved and reduced by oxidation from 1⅛ in. to ½ in. in diameter the remaining metal was quite sound. Here in one case, we have a piece of pipe ¼ in. thick melting away like sugar in less than a week; in the other a wrought iron stay lasting for nearly twenty years without losing a particle of its "nature."—[Railway Review.

Saw Mill Boiler Explosions.

Statistics show that 60 per cent. of the boiler explosions that occur in the United States are boilers connected with saw mills. This goes to show that one of three things must be at fault. First, repairs are neglected; second, cheap boilers; third, incompetent help. Each and every one of these are the outcome of the spirit of economy which seems to pervade the very air of a saw mill. In many instances there is a combination of all three of the serious faults mentioned. Laying aside all laws of justice and protection to human life, every one of the three items mentioned is a false economy. For two or three years a few dollars may be saved, when some day things go up with a bang and wipe out all former profits, to say nothing of a few lives.

Economy is an admirable quality in human nature, but the line should be drawn at a false economy that reacts as an expense account.—[Saw Mill Gazette.

To locate the deficient working of machinery with numerous points of friction causes often both annoyance and waste of time, owing to the surrounding noise interfering with the observation of the sound to be isolated. The *Revue Industrielle* mentions as an effective and exceedingly simple means of overcoming this difficulty the use of a rubber tube about a meter long, one end of which is placed in the ear and the other passed over the suspected spots. The vibrations from all other parts than the one covered being excluded, it is an easy matter to locate jarring noise and, when found, to observe the intensity and periodicity with which it occurs.

AMERICAN STEEL WORKS AS SEEN THROUGH ENGLISH EYES.

The visit of the Iron and Steel Institute to this country, and the criticisms made by some of its members upon the management of our iron and steel works have called renewed attention to the differences between American and foreign engineering practice to which we have frequently referred.

The point of difference which is most observable is the rapidity with which all operations are conducted in America, as compared with foreign iron and steel works. Here both men and machinery seem to be strained to the utmost in the effort to turn out the largest possible number of tons in a day. The energy of the American owners is concentrated on the saving in two great factors in production, the number of men employed and time. Wages are high, therefore the labor must be dispensed with wherever possible, and automatic machinery substituted. Time is still more valuable, and none of it must be wasted. It appears to be as criminal for a machine or a furnace to stand idle as for a man.

In consequence of this hurry and rush in American works, other economies are apt to be neglected, and such neglect seemed to elicit criticisms from our English visitors, which overbalanced their approbation of our skill in other directions. The waste of material was especially objected to. The amount of our crop ends in steel mills would not be allowed in any English works. Our steam engines were thought to be decidedly wasteful of steam, and our boilers not durable nor safe. Fuel economy, except in a few of the best managed works, seems a matter of no importance, and no attempt is made to save by-products of coke ovens as in Europe.

No doubt many of these criticisms are well deserved. Until the introduction of natural gas in Pittsburgh, the waste of coal in that city was simply scandalous. Scarcely a steam boiler could be found in the city in which the temperature of the chimney gases was not from 800 to 1,000 degrees Fahr., and the puddling and heating furnaces were, with few exceptions, of the old styles which seem to be especially calculated to utilize only 5 per cent. of the fuel burned in them, and to waste the other 95 per cent. Steam engines also, except in recently built or remodeled works, were of the old-fashioned, slow stroke, throttling and non-condensing styles, the retention of which in these days of compound condensing engines is a disgrace. Since natural gas has been introduced, its great abundance and cheapness has even served to retard improvements in steam plants in iron and steel works, but now that there are signs of the exhaustion or curtailment of the supply, and the price charged for its use is raised, there will likely be more attention paid to its economy.

In each of the cities which the foreign guests visited, the daily papers showed their usual enterprise in printing interviews with some of the visitors, in which they were made to express unbounded astonishment and approbation of what they had witnessed in America; but to one who had traveled with them from place to place it was noticeable that the expressions of commendation were generally offset by criticisms. What nature had given to America, such as her climate, her scenery, her greatness of distances, her mineral and agricultural wealth, her natural gas, were extolled as they should be; but what man had done was usually but faintly praised. Very clever! but I think our way is quite as good, if not better, was a common verdict. The large daily product of our blast furnaces was attributed to our excellent ores, and not to skill in management, and the short life of the furnaces was contrasted with the long life of foreign furnaces, to our detriment. Our rapid rail rolling was thought not to produce as good rails, and to be obtained with an excessive wear and tear of mill and driving of the men, which would not be submitted to in England. Even our newest machine works, such as the Westinghouse Air Brake Works, at Wilmerding, were found fault with as not being sufficiently lighted.

Much of the criticism was undoubtedly due to the mental habit of the Englishman—he is usually on the lookout for something to find fault with; but it is well for us to be criticised occasionally, as it may reveal to us shortcomings which we had not before suspected, and lead to improvements in our practices, even if it should necessitate the copying of some foreign ideas and methods. While we do lead the world in the output of our blast furnaces, converters and rail mills, there are many lessons we may yet learn from our transatlantic rivals.

It is a conspicuous fact, which was frequently brought out in addresses made at the meetings, that America is indebted to England for nearly all our iron and steel metallurgical methods, and while our iron and steel engineers have taken precedence in developing the mechanical engineering features of the works, they have not been noted as originators of new metallurgical processes. The names of Huntsman, Cort, Neilson, Heath, Mushet, Beesemer, Siemens and Thomas stand pre-eminent as English metallurgical discoverers, and no list of Americans can be named who can by any stretch of the imagination be compared with these as great orginators and discoverers in iron and steel metallurgy. The one American engineer whom by common consent is accorded the first rank among American steel works engineers, the late A. L. Holley, was strictly a mechanical engineer, and his work was in improving the methods of handling Bessemer steel and not in the process of making it. Of those who have brought our practice to its present stage of progress, such as the brothers Fritz, the two Joneses, Forsyth, Fry and Hunt, there is not one who has contributed to it any original metallurgical idea. They have merely as mechanical engineers adopted the leading ideas of the foreign metallurgists, invented and improved machinery for carrying out these ideas, and have shown extraordinary skill as organizers of men and machinery in such a way as to turn out vast amounts of product.

There is nothing in the character of the American mind which prevents it from producing great iron metallurgical discoveries, for we have invented many processes for the extraction of other metals from their ores; but the reason it has not done so heretofore in iron, seems to be due to the fact that the conditions under which the American iron industry has existed during past years has not been conducive to such discoveries. An American iron master and his engineers have in the past had no opportunity to make discoveries. In times of dull trade there is no money available to spend for costly experiment. When trade is brisk all the energies of master and men must be centralized on the single work of increasing the output and piling up the profits or extending the works, and there is no time of leisure to devote to experiments. No great discovery in metallurgy has been made and brought into actual use without years of hard work, patient study, and costly experiment. The letter which Sir Henry Bessemer transmitted to the Pittsburgh meeting, published in the *Journal* of October 11, recounting the story of his invention of Bessemer steel, gives rise to the question, What American ironmaster or metallurgist, even if he had conceived the idea at or before Bessemer's time (as William Kelly did, in fact), could have done what Bessemer did to bring the invention to a success? Who could have spent the money and time that he did, in spite of discouragements and obloquy for years, to develop an idea which was denounced on every side as a delusion?

In the development of the mechanical engineering of iron works, which has been the especial work of Americans, there has been no such difficulty. Each step forward, in the way of improved machinery for handling, brings an immediate financial return and encouragement to go further. Hence the engineers have had a chance in this country which the chemists and metallurgists have not.

The time has now come, however, when metallurgical discoveries ought to be as much expected here as in Europe. Many of our establishments are now on a solid basis, possessing great wealth, mechanical equipment which ought to be good enough for ten or twenty years without further improvement, excellent organization of both technical and managing staff, and finely equipped chemical laboratories. Some of these works should be able not only to develop students and discoverers, but to provide them with sufficient money for metallurgical experiments.

Another path in which the American works can now develop is in that of reducing wastes of fuel and of material. Now that mechanical engineering has developed machinery to such an extent that the smallest possible amount of manual labor is required, the engineers might be allowed to take a rest in this direction and devote themselves to perfecting the steam boilers and engines and furnaces, with a view to saving fuel. The question of coking our poorer coals should be studied and methods adopted of saving the valuable products now thrown away in the waste gases. The waste in crop ends, in scaling, in fluxing, etc., should also be studied and remedied.

If the owners of our larger works would pay some attention to these questions it would result before long in removing the reproach that we are behind Europe in these matters, and might in time enable Americans to point to a list of metallurgists who would rank with the English names above and with the list we already have of mechanical engineers.—[Engineering and Mining Journal.

A Tower for Chcago.

A tower of iron and steel, 1,500 feet high, has been designed by Charles Kinkle and G. R. Pohl, architects, of Washington, D. C., to be erected in connection with the World's Fair, at Chicago, and it is said that a number of capitalists in New York, Washington and Chicago are behind the enterprise, and will erect the structure without asking aid of the fair managers or anybody else. The only name given is that of M. B. Baily, a contractor and builder, who is one of the incorporators. The tower, according to the report, is to be erected within a mile of the commercial centre of the city, regardless of the location of the fair, be permanent and cost $200,000. The base will be 480 feet in diameter, with a "skeleton of steel-framed lattice work on 16 hyperbolic curved legs;" and there are plans for a hall with a capacity to seat 30,000 people, and a hotel with 4,000 rooms in the structure, space for the public library, rooms for the Grand Army, public institutions, etc. There are to be eight elevators for the first 100 feet, four to 200 feet, four to 400 feet, and two to the top. The floors will be 33 feet apart.

A Monstrous Casting.

An immense casting, probably the largest ever undertaken in the history of the Bethlehem Iron Co., is in progress to-day. The time required for the melting of the metal used will be five hours. All the cupolas, six in number, in the Bessemer department are in use for this casting, besides No. 1 and No. 2 blast furnaces. The metal tapped from the cupolas in the Bessemer converting department will be taken to the mold in the ordnance plant in transfer ladles placed on trucks and drawn by the company's narrow gauge locomotives, five or six in number. The preparation of the mould required from four to five weeks, and was made under the direction of Chief Engineer and Superintendent John Fritz, assisted by Chief Founder Michael Bitler and his assistant, Nicholas Ulrich. The casting is to be used in the construction of the armor plate mill in the ordnance department now in course of erection.—[Bethlehem (Pa.) Times, Oct. 27.

Another Victory for Nickel-Steel Armor.

Some armor plates of nickel steel, made by Schneider & Co., of Creusot, for a Chilian iron-clad, have been officially tested at Garve, France, with results equally as good as those obtained at the recent Annapolis trials. The plate chosen measured 18.32 feet by 6.75 feet, and 5.31 inches to 8.07 inches in thickness. The gun used was of 6.4 inches calibre, and the projectiles were of chilled cast iron. Three projectiles were fired, with a striking velocity of 1,463, 1,459 and 1,564 feet per second. These energies were more than sufficient to send the projectiles entirely through an iron plate of the same thickness as the steel plate, but after the fire the plate under trial presented but three slight cracks, all starting from the point where the first projectile struck. Neither the backing nor the bolts suffered.

AMONG THE IRON MINES.

Lake Superior Shipments of Iron Ore:—

Lake shipments of iron ore from the mines of Lake Superior, for the season of 1890, up to Wednesday, October 22d, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	202	Hortense	10,762	Pitts. & L. Angeline	231,077
Barnum	8,495	Humboldt	20,647	Prince of Wales	24,518
Buffalo	75,637	Imperial	20,811	Prout	11 804
Cambria	61,593	Jackson	106,947	Queen	91,639
Champion	210,823	Lake Superior	259,523	Republic	159,328
Cleveland	223,337	Lillie	30,935	Republic Reduction Co.	3,955
Cliffs Shaft	145,703	Lucy	40,183	Salisbury	78,742
Detroit	4,058	Marquette Ore Co	2,243	South Buffalo	114,857
Dexter	4 548	Michigamme	51,539	Volunteer	123,879
East New York	27,614	Milwaukee	24,6 8	Winthrop	72,371
Fitch	10,937	Negaunee	66 t 27		
Grand Rapids	5,245	New York	2,423		
Total, Marquette Range					2,332,615

MENOMINEE RANGE.

Aragon	32 670	Hersel	345	Norway	59,209
Armenia	23,878	Iron River	133,801	Paint River	49,396
Chapin	569,597	Ludington	72,554	Perkins	8,720
Commonwealth	102,391	Manganese	1 016	Pewabic	18,188
Cyclops	48,109	Mansfield	13,766	Shafer	47,552
Dunn	123,113	Mastodon	58,578	Sheridan	545
Florence	176,727	Mastodon South	845	Vulcan	118,965
Great Western	65,613	Millie	28,400	Youngstown	37,770
Half and Half	616	Monitor	18,752	Walpole	2,248
Hamilton	17,582	Nauaimo	1,630		
Total, Menominee Range					1,831,730

GOGEBIC RANGE.

Anvil	28,973	Eureka	23,794	Odanah	1,666
Anvil No 2	10,951	Father Henuepin	7,150	Pabst	104,625
Ashland	358,804	Federal	14,963	Palms	27 098
Aurora	187 380	First National	105	Ruby	10.873
Brotherton	56,584	Germania	35,362	Section 33	90,636
Cary	77,220	Iron Belt	94,245	Sunday Lake	2,350
Colby	179,662	Montreal	8,146	Superior	25,183
Comet	1,637	Mt. Hope	57,323	Trezona	38 439
Davis	564	Norrie	719,329	Windsor	24 907
Total, Gogebic Range					2,197,253

VERMILION RANGE.

Chandler	309,289	Minnesota Iron Co	481,328	Pioneer	10,244
Total, Vermilion Range					800,861
Grand Totals					7,162,459
To corresponding date of 1889					6 043,080

The figures show that lake shipments from the mines are holding well up to the volume of last year, despite the diminution of output from several of the mines at Ishpeming, caused by the recent strike. The men have returned to work, and the mines affected by the strike being again in operation, it is reasonable to suppose that there will be no further falling off in output while navigation lasts, and that the gain over last year's shipments by lake already made will be held until the close of the shipping season. The mines are now 1,114 379 tons ahead of their shipments by lake at this stage of the season a year ago.

Lake Superior Mining Notes:—

MENOMINEE RANGE.

Underground work has been resumed at the Glidden. The mine has been supplied with a new hoisting plant.—[Florence Mining News.

A nice little body of ore is being opened up between Nos. 1 and 2 Cyclops, under the sandstone. From the present indications the product of the Cyclops for next year will greatly exceed that of this year.—[Florence Mining News.

The Loeftelholz Exploring Co. has struck a fine vein of Bessemer ore at its exploration at Waucedah. The vein is said to be six feet wide, and widening out as depth is attained, and the ore of a fine quality.—[Florence Mining News.

Work at the Mammoth has been suspended for the present—probably until Spring, providing the company can make satisfactory arrangements with the fee owners. The exploration looks very encouraging, there being good ore in one portion of the shaft, but the management prefer to wait until Spring before continuing the work of development.—[Florence Mining News.

A blast at the Wagner exploration cut a stream of water of greater volume than the pump could handle, and it was drowned. The accident delayed work but a short time. The work in the drift is showing up well and will probably cut the ore vein before many feet of ground are left behind. Considerable ore has been raised in the work of sinking.—[Diamond Drill, Crystal Falls.

Work is to be resumed at the May mine. The property has been idle all Summer. Considerable work has been done on the property at different times, and a vein of ore of good width shown. The interested parties, being Negaunee gentlemen, will develop the mine as rapidly as possible.—[Diamond Drill, Crystal Falls.

The *Mining News* is authority for the statement that in the Baird property, Florence county will have another shipper next year.

GOGEBIC RANGE.

Capt. Wm. Knowles has had a party of St. Paul capitalists on the west part of the range, looking over the Upson district and another company has been formed. Capt. Knowles has done, and is doing, much to attract capital to the range, and is getting it interested in developing new options.—[Florence Mining News.

The new working shaft at the Jupiter is going down rapidly under the circumstances. The management claim to have 30 feet of good ore in the crosscut from the old shaft, and there is a natural anxiety to get down to it, and to develop during the Winter season.—[Florence Mining News.

The shaft at the Minnewawa is now down to a depth of about 400 feet, and the showing is most encouraging at present. The shaft is bottomed in ore of a fine quality, and there is every indication that a very rich lens has been struck.—[Florence Mining News.

Representatives of the parties who bought an interest in the Geneva property have been on the range this week, and preparations are being made to increase the facilities for development work. If the expectations of the company are realized, and a large deposit of ore is found, it will be of much importance to that part of the range.—[Florence Mining News.

A Plummer, Wis., special to the Ashland *Press*, says: The mines in this vicinity are looking well, the Sampson showing up good. The shaft is now down to a depth of 208 feet, the cross-cut which is being driven south from the shaft is now down 35 feet. They have passed through several small veins of ore, and in fact the whole of the cross-cut is mostly ore. It is thought that a large body of clean ore will be found before reaching the foot-wall, which is some 80 feet or more from the end of the cross-cut.

MARQUETTE RANGE.

The Dexter is showing considerable fine ore, and will probably make a fair shipment another season. They are producing ore very rich in manganese that commands a ready sale at good price. Geo. R. Parsons, of Ishpeming, is general manager.—[Florence Mining News.

Figuring the product of the mines of the Ishpeming basin, says the Ishpeming *Iron Ore*, we secure conclusions that are of a very pronounced character. The list is a formidable one, and the total production of a magnitude which is pleasing to all the people of Ishpeming. It represents an enormous expenditure in the way of equipment, a vast treasury in the direction of money paid to labor. In the latter channel no other mining region extant can show a better average when all the conditions are taken into consideration. We append the list and the ore each has to its credit:

Lake Superior	5,001,065	Saginaw	439 378
Cleveland	4,129,423	Salisbury	678 824
Lake Angeline	1 772,027	Detroit	1 4,712
Iron Cliffs	1,219,979	Fitch	15 937
New York	1,155,296	East New York	64,957
Winthrop	1,089,524		
Grand Total			15,947,070

Here then we have a grand total of 15 947,070 gross tons produced by the mines of the Ishpeming basin, over one-half of the entire shipments from the renowned Marquette range, which has a credit to date of 31.309 176 gross tons. Giving an idea of the magnitude of the mines of the Ishpeming basin, the following figures with reference to other Lake Superior ranges will be of interest. The latter have produced as follows:

Marquette	31,309,175	Vermilion	3,096,877
Menominee	11 047,220		
Gogebic	7,389, 21	Total	52,842,993

VERMILION AND MESABA RANGES.

A large amount of exploring will be done on iron lands on the eastern part of Mesaba range this Fall and Winter. A number of properties of the big Mesaba Iron company will be looked over by iron men, who hope to lease them in the near future for active operations, while all the way through toward Grand Marais the range will see a beginning of the activity it deserves.—[Duluth Herald.

English and American Furnaces.

The progress of American blast furnaces is shown by the record read by Mr. Gayley before the Institute at New York. In 1876 the Isabella made 28,000 tons in 12 months, at an expenditure of 3,000 pounds of coke per ton. In 1889, No. 8 Edgar Thomson made 113,000 tons, consumption of coke 1 920 pounds per ton. In the discussion of this paper Sir Lowthian Bell gave a comparison of blast furnace practice at Braddock, Pa., with that in the Cleveland district, Eng., as follows:

	Cleveland furnace.	Pittsburgh furnace.
Cubic contents, cubic feet	15,500	19,800
Temperature of blast	704° C	593° C
Coke per ton of iron, cwt	19 99	16 80
Limestone per ton of iron, cwt	11.66	10 71
Ore per ton of iron, cwt	48.	32.23
Weight of blast per ton of iron, cwt	87.15	71 20
Weight of gases per ton of iron, cwt	119.47	100.10
Temperature of waste gases	250° C	160° C
Tons of iron per 1,000 cubic feet of space per week	22	117
Slag per ton of iron	28	10 71
Calories required per ton of iron	88.577	69.244
Cwt. coke required for fusion of slag	3-44	1-43
Cwt coke required to heat waste gases	1.60	0.93
Approximate heat requirement to cover loss by radiation, convection, tuyere, water, etc., calories	9 740	8.987

He concluded by stating that it was probable that both the Pittsburgh furnace and the Cleveland furnace were working under the best conditions for the ore and fuel, and that if the rate of driving of the Pittsburgh furnace were either increased or diminished, the results would not be as good, while with the Cleveland furnace no better results would be obtained by more rapid driving.

Iron Ore Discovered by Lightning Strokes.

Commenting upon a report that a house in Ohio, supposed to be situated over a bed of iron ore, has been struck by lightning eight times within three years, a writer in the Chicago *Journal of Commerce* says: The truth is that all iron ore deposits are not confined to the several well-known localities of the United States where they most abound. If careful observation was made, undoubtedly many new fields might be opened up in places where the presence of iron is not now suspected. The writer, in his youth, lived on a farm in Southern Wisconsin, on two acres of which lightning had struck, it was estimated, at least forty trees. No sane man could for one moment suppose that the stricken trees of themselves possessed sufficient metallic attraction for the lightning to single them out for destruction. The suggestion made at the time, that underneath these two acres was a bed of iron ore, has never been effaced; yet it is doubtful if ever any other person noticed the peculiarities of that particular plat of ground.

Nature seldom errs in her indications of mineral wealth, and makes electricity a prominent agent in determining the location of iron deposits near the surface. Hence if a forest at any point shows unusual effects of lightning, or if a house becomes a peculiar attraction for it, it might pay to engage an experienced prospector to develop the hidden ore.

ON THE STRAINS IN SINGLE RIVETED JOINTS.

In the course of some recent correspondence between this office and Mr James E. Howard, of the Watertown Arsenal, some points concerning the shape of test pieces of boiler plate, and the distribution of strains in single riveted joints, were discussed, which may be of interest to readers of the *Locomotive.*

Tests made at the Arsenal are executed upon strips ten inches long and an inch and a half wide, and of the thickness of the plate as rolled. Strips of these dimensions compare well with larger specimens, say 5 or 8 inches wide, and 15 or 20 inches long. Substantially the same results are obtained, whether the specimens have enlarged ends or parallel sides. Inasmuch as strips of the

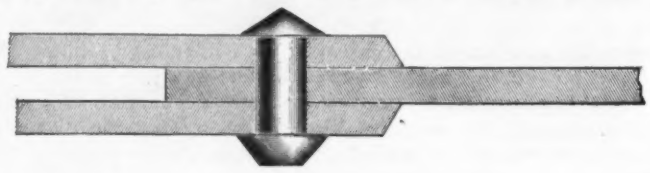


FIG. 1.

dimensions given above (*i. e.* 10″x1½″) appear to allow unrestricted flow of the metal, so far as form is concerned, it seems fair to consider that they represent the true qualities of the material, and the indications that they give are entitled to confidence in designing riveted joints or other built-up forms.

The strength per unit of area, along the net section in a riveted joint, depends upon a number of conditions which vary considerably in different joints, so that the tensile strength of the net section in some joints largely exceeds that of the strip, and in others falls far below it. The conditions in perforated test specimens are in some respects quite similar to those existing in a joint; but yet there is enough difference to cause them in many cases, to give results appreciably different from those obtained from the joints themselves.

The simplest form in which a joint can be studied seems to be that represented in Fig. 1, where an annealed steel plate with drilled holes is riveted between two other plates, using one line of rivets. This corresponds to one-half of a single riveted butt joint, in which the covers are extended to a sufficient distance to be grasped in the jaws of the testing machine. In this joint we

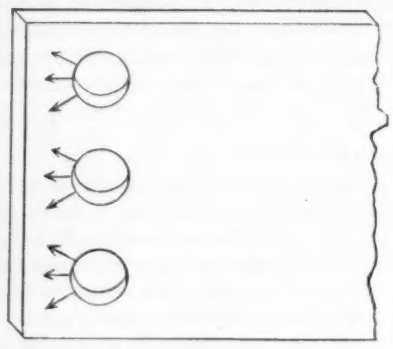
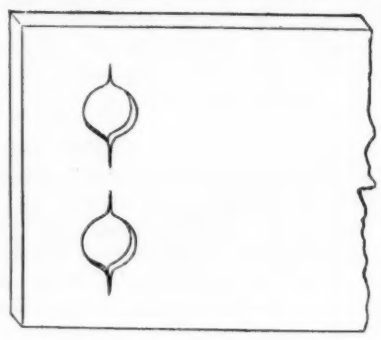


FIG. 2.



F.G. 3.

eliminate many of the influences which tend to complicate the study of most other joints. The stresses radiate from the rivet holes, as in Fig. 2; the metal about the holes is left in its normal condition, on account of using drill holes; and there is no bending of the plate as in a lap joint.

It will be seen that in pulling against the rivet holes we change the conditions from a perforated plate in which the stresses pass by the holes. To take an exaggerated case for illustration, suppose we had an excessively wide pitch of rivets as in Fig 3, and a correspondingly perforated plate, as in Fig. 4. The concentration of stress at the rivet holes in the one case would tend to cause fracture in detail, the metal first separating at the sides of the holes and then tearing across; whereas, in the perforated plate, the percentage of metal removed being small, the stress on the net section would remain substantially uniform.

If the rivet holes are punched, and the pitch very close, the cold hardening of punching might impart increased strength to the entire net section; while in a wider pitch, the punching would be an element of weakness by

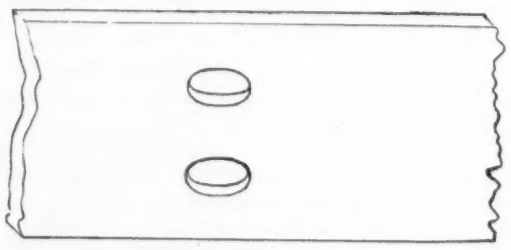


FIG. 4.

destroying a part of the ductility of the plate at the points where this ductility is most needed. These same considerations apply to wide and narrow grooved specimens. (See Figs. 5 and 6) The narrow one has the entire net section re-enforced by the surrounding metal, while the wider specimen merely begins to tear out at the edges on account of the larger, and consequently more rigid section of metal on either side of the groove. (Of course it will be understood that all these effects are exaggerated in the cuts)

A riveted joint gives the best result when the net section is most re-enforced by the solid section of the plate, or when the stress is substantially uniform over the net section extending from rivet hole to rivet hole.

When rivet holes are enlarged, the metal is stretched more at the sides of the holes than at the middle of the pitch (*i. e.* at *x x* in Fig. 7), and a metal which in the tensile strip shows a large stretch near the maximum load with a small change in the load, seems particularly well adapted to distribute the

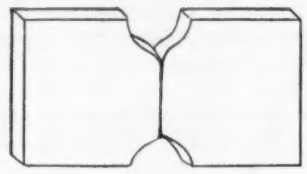


FIG. 5.

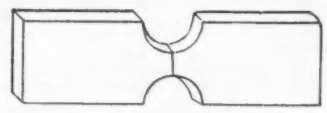


FIG. 6.

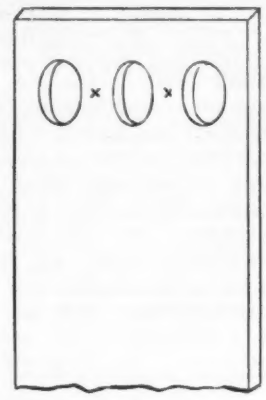


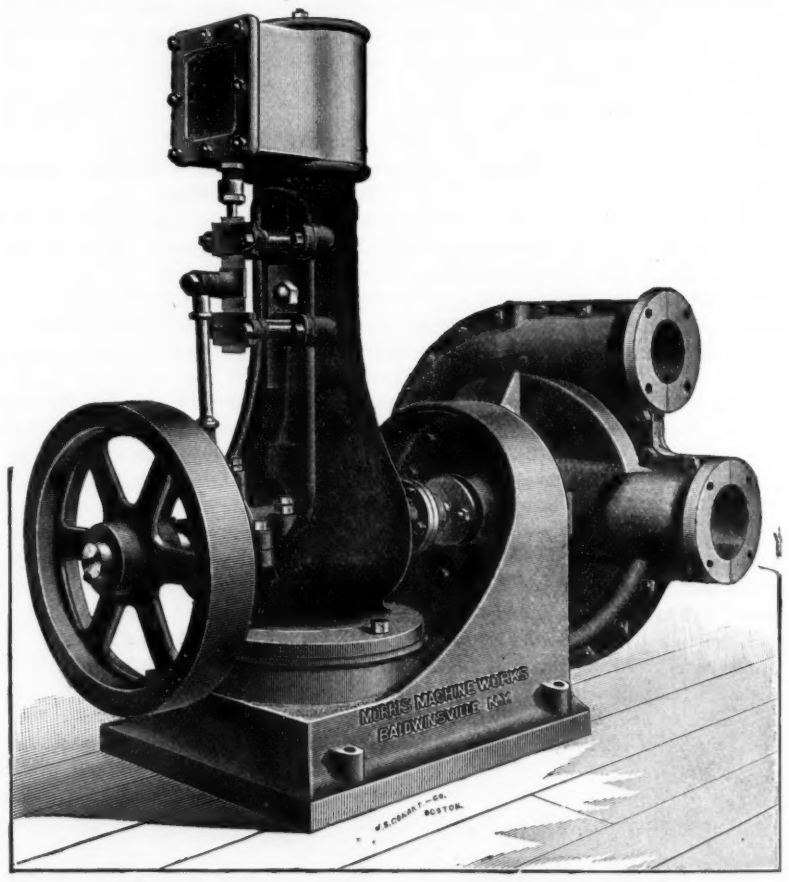
FIG. 7.

stress from the rivet hole to the middle of the net section. In case this is an important point it will readily be seen what a variety of conditions we may have in different grades of metal.

The foregoing are some of the considerations which make a simple joint appear complicated when it is examined closely. There are numerous other considerations of a similar nature, one of which is the effect of temperature on the strength of the metal. Tests have been made at Watertown at 200°, 250°, 300°, 350°, 400°, 500°, 600°, and 700°, Fah., the highest strength being found in the neighborhood of 500° Fah.—[The Locomotive.

CENTRIFUGAL STEAM PUMPS.

A very compact centrifugal steam pump is illustrated herewith. It is made in sizes varying from 1½ inches to 30 inches discharge openings, with capacities of 100 to 50,000 gallons per minute. The manufacturers, Morris Machine Works, Baldwinsville, N. Y., claim to be the oldest as well as the largest firm engaged in this line of manufacture in this country, and their annual sales exceed those of all other makers combined. The pump shown is of the double-suction variety. Being without valves, these pumps will readily handle grain, coal, etc., without injury to themselves in any way. They are used largely for wrecking purposes and sand pumping, drainage and irrigation, nearly 16,000



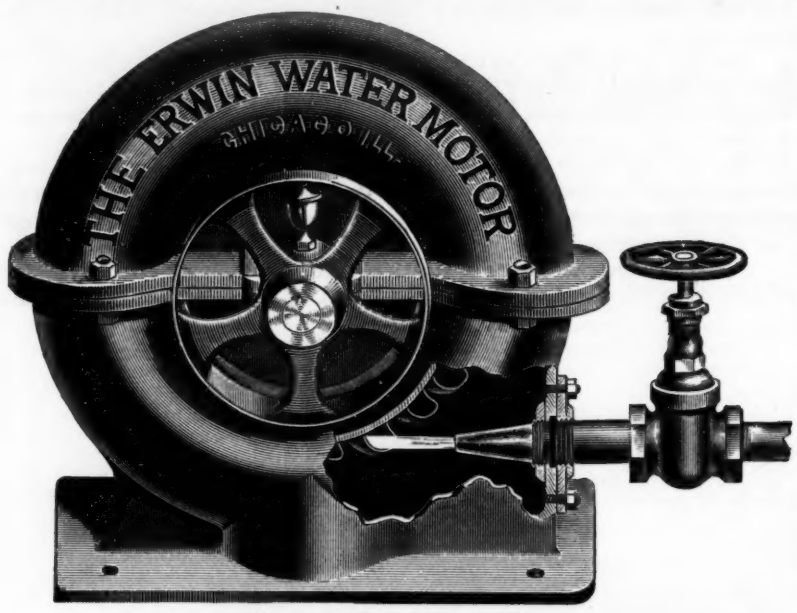
of their pumps being in use. Prominent officials of the United States War Department evidently consider these centrifugal steam pumps as being superior to all others as witnessed by the recent order sent from the department for pumps to control the locks at the Sault Ste. Marie Canal, while commercial and mining experts amply endorse the manufacture; $18,000 worth of pumps having recently been shipped to Mexico for mining purposes. For tables of capacities, prices, etc., address the makers, Morris Machine Works, Baldwinsville, N. Y.

Iron Amphitheater in the City of Mexico.

The Riverside Bridge & Iron Works, of Paterson, N. J., have closed a contract with a Mexican syndicate to erect an iron amphitheater in the city of Mexico that shall cost $25,000. The amphitheater building will have an iron dome 75 feet high and 200 feet in diameter. Bids from abroad were far in excess of these figures.

THE ERWIN HYDRAULIC ENGINE.

The accompanying illustration represents a combined steam pump and water motor, manufactured by the Erwin Hydraulic Engine & Steam Pump Co., 51 Canal street, Chicago. The Erwin hydraulic engine is formed by the combination of their water motor attachments with any of the various styles or sizes of steam pumps, whereby any steam pump may be made to perform the two-fold duty of a steam pump and high speed engine. The motor attachment in no way conflicts with the ordinary use of the pump, but instead it greatly enlarges its field of usefulness. While the ordinary steam pump can be used for pumping water only, this combination can, in addition thereto, be used for driving all kinds of machinery. By closing the pump valves and opening the motor valves the water contained in the pump will, as the pump is operated, be driven with great force upon the motor wheel, whereby the wheel will be rotated with great speed and power, the speed varying from 500 to 2,000 revolutions per minute, according to requirements, the same water being used continuously as long as the pump is operated. By reversing the position of the valves, thus closing communication with the motor, the pump



THE ERWIN WATER MOTOR.

may be used in the ordinary way for pumping purposes. Motors can be readily attached to all pumps now set up and in use. In the latter case it is an important consideration that a fine high speed engine is thus produced at the small additional cost of the motor only. The condition of fire and other pumps, otherwise seldom operated, is improved by use, and their value, owing to their two-fold capacity, greatly enhanced. Aside from their two-fold use, the above device has many great advantages as an engine only.

First.—It runs noiselessly, and with steady, uniform movement.

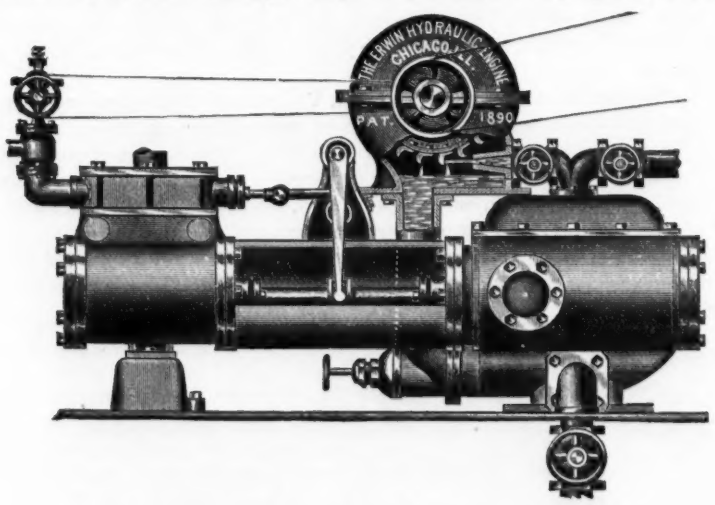
Second.—Owing to the rotary movement, there is no vibration, and expensive foundations are unnecessary.

Third.—Engineers are not needed to operate the engine. It is simple and durable, and requires no more attention than an ordinary pump.

Fourth.—Dynamos may be attached directly to the driving shaft, belts dispensed with, and but small space required.

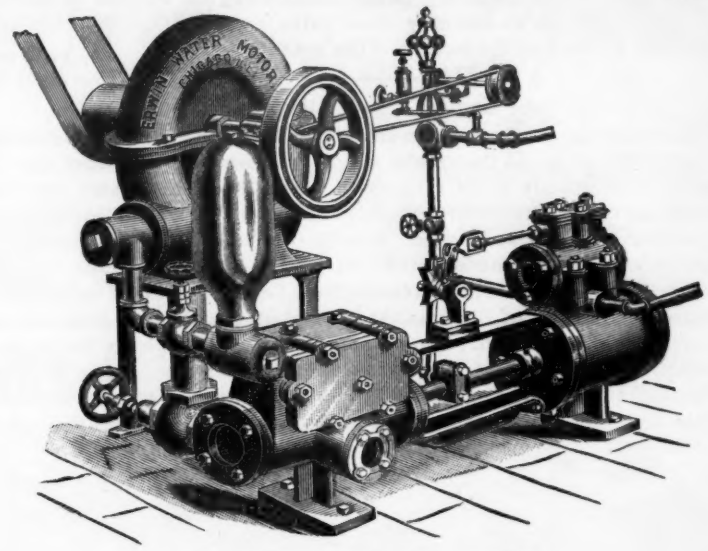
Fifth.—Any given motor may be used for greater or less horse-power, by changing size of nozzles furnished.

Simultaneous two-fold use.—Pumps used for driving machinery may be simultaneously used for feeding a boiler. The makers are prepared to furnish



THE ERWIN DUPLEX HYDRAULIC ENGINE.

a combined pump, motor, dynamo and steam boiler. By this combination a dwelling or store may be supplied with water, heat, power and electric light, while the pump may be simultaneously used for feeding the boiler with water. Its actual power has been fully demonstrated by careful break-tests to show an efficiency of about 85 per cent. of the full power of the pump. The manufacturers claim for their water motor, as proved by accurate comparative break-tests, to be of higher efficiency than the best heretofore made. These comparative tests, they state, were all made by a disinterested and eminent hydraulic engineer, at the same time and place, and under precisely the same conditions, and they assure the public that their motors have no equals in efficiency. Owing to its two-fold capacity as a pump and motor, this engine is especially adapted to be used in creameries, breweries, laundries and tanneries; while for electric lights and water power for cities, it will be found peculiarly applicable, and a very important factor in those lines. There are in the United States a large number of city water works, erected and maintained at great cost, which are used principally, if not solely, for fire protection. Also many places where three or four hours' pumping each day is all that is required to supply the reservoir for 24 hours. As thus used they represent a vast amount of non-productive capital, which, by this invention, may be put to a highly remunerative use. At a comparatively small additional cost many of the high duty steam pumps now made may, by this motor combination, be transformed into high speed engines, having no superiors for running dyna-



THE ERWIN HYDRAULIC ENGINE.

mos, through the medium of which cities may be supplied with electric light and power, and the great expense of a separate additional plant for such purposes thereby avoided. These motors are fully protected by broad patents in America and the principal European countries. Additional information may be had by addressing the manufacturers as above. As an evidence of the favor with which the Erwin hydraulic engine is received, it has among others, been endorsed by and formed in connection with the pumps of the following steam pump companies: The Hooker Steam Pump Co., the Buffalo Steam Pump Co., the Worthington Steam Pump Co., the Smith & Vale Steam Pump Co., the Marsh Steam Pump Co., and the Hooker-Colville Steam Pump Co. Three of these engines are now being operated at the Chicago Industrial Exposition, driving, respectively, a dynamo, a fan, and a blower.

Tools, Dignity and Civility.

A gentleman bought some machine tools of a certain firm, and not receiving them when promised, wrote, requesting to know why they were not delivered. To this he received no reply. Waiting for three days longer than it would take for an answer, he telegraphed briefly: "Send tools at once or let us know why; in great need of them." This brought a reply from the superintendent, who fancied that this called for what he thought was a dignified rebuke. So he answered: "Tools will be sent when we are ready; not before." The customer took the next train to the works—only one hour's ride—and brought the telegram with him. He ignored the superintendent, and went to the president with his grievance, who, being a sensible man, soon arranged matters to the buyer's satisfaction. Then the president interviewed the superintendent, and gave him some good advice on the subject of politeness in trade, which it is to be hoped he profited by.

Human nature is weak, and the best of us are liable to err; but it is a bad thing to err on the side of incivility. No matter how large or how small an order may be—five cents or fifty thousand dollars—the buyer is entitled to courteous treatment and prompt attention. The mouse gnawed the lion free of the net, and the five cent order man may know a fifty thousand dollar order man, whom he will take where he will be well treated. Civility pays every time. It is a cardinal point in business, boors should remember that rudeness always recoils upon those who exhibit it.—[Manufacturer and Builder.

The Great Nickel Enterprise.

S. J. Ritchie, T. W. Cornell, Geo. G Allen, of this city, and Judge Burke, of Cleveland, have started for Sudbury, Ont., to meet the party of English iron and steel men who are making a tour of the country. The nickel deposits will be looked over. Garnier, French expert, who came over to test the Sudbury syndicate's nickel, has gone back to France under contract to return early next year and superintend erection of big works in Cuyahoga valley, near Cleveland, for reduction of the ore and extraction of nickel. He has a process for elimination of sulphur.—[Akron, O., Beacon.

The Cost of Firing a 110-Ton Gun.

According to a calculation made by the *Economiste Belge*, the cost of firing a 110-ton gun is, in round numbers, $832, divided as follows: 990 pounds of powder, $380; 1,980-pound projectile, $435; silk for cartridge, $17—$832. But this is not all. The 110-ton gun, it appears, can be fired but 95 times, and after that becomes incapable of being used, and requires repairs. Now, the cost of the piece being $82,400, it is necessary to estimate the costs of wear at about $868 for each shot, thus raising the cost of each charge to $1,700.

A NEW TRIPLE COMPOUND ENGINE.

The accompanying illustrations show side and end sectional elevations of a novel arranged triple compound engine, recently brought out by Hjlete, Johnson & Co, 156 West Ohio street, Chicago, Ill. As will be seen from the side elevation the main valve is in fact a rotary engine by itself. The small valve above is a reversing valve. Steam being admitted to the main valve rotates it, and by means of the ports is worked successfully through the three parts of the main cylinder. The engine can be worked either condensing or non-condensing. There is no link motion or complicated valve gear, and the engine reverses by a single movement of the reversing valve. The main points urged in favor of this engine are that it effects a large saving of steam, can be made as cheaply as any single cylinder engine, and can be handled by any one who can run an ordinary slide valve engine. One of these engines can be seen at work at the factory of the manufacters.

An English View of the New Tariff.

Whatever may be the opinion in Europe as to the effect of the new American tariff, the views of those who ought to know on the other side of the Atlantic are certainly more sanguine. Being solely interested in the iron industry, we observe that our protectionist cousins in the trade are expecting, and preparing for, a grand boom. A cable received recently announced to us that most of the great iron and steel companies in Pennsylvania are enlarging their capital. The Pennsylvania Steel Co. has increased its capital from three to five million of dollars; the capital of the Phœnix Iron Co., will be increased by one million; the Bethlehem Iron Co., which has a contract for armor plates, proposes to increase its capital from three millions to five millions; the Cambria Iron Co. proposes an increase of one million; the Thomas Iron Co. has made its capital $2,500,000. We further learn that the Cramp Shipbuilding Co. (Philadelphia) is doubling its capacity, and enlarging its capital to five millions. All this looks very hopeful, and we only trust that our friends, although rivals in trade, will not be disappointed. The iron and steel interests in the the United States have worked most perseveringly with a distinct object in view; they have secured a most prohibitory tariff with the aid of their political friends, and they ought now to make hay while the sun shines, and to make it quickly. When the country once begins to feel the effects of the protectionist policy *a outrauce* now initiated, such a reaction will set in against its authors as to undo all their work, or we are very much mistaken.—[Iron (London).

Important Change in the Illinois Steel Company.

The stock of the Illinois Steel Co., Chicago, Ill., advanced 10 points on the Boston stock board Thursday, going from $88 to $99. In explanation is offered the statement that a combination of iron men is trying to secure the control of the company in the interest of O. W. Potter, who retired from the chairmanship of the executive committee a few months ago, owing to dissensions in the management. The Illinois Steel Co. is a corporation with an authorized capital of $25 000,000, and about $17,000,000 in stock afloat. Convertible 5 per cent. bonds are also on the market to the extent of $5,000,000. There has been little demand for these securities for many months. The stock has been down to $88, and even lower. The Boston News Bureau says that the price at which the Potter syndicate is negotiating the stock is $120, less commission, not to exceed $5 per share. Chicago and New York stockholders have already signed an agreement to sell their holdings, and now the more Eastern stockholders are offered the opportunity. Already many signatures have been secured, but some delay is experienced because of the illness of Mr. Nathaniel Thayer.

Iron Ore Discoveries in Nebraska.

The recent discovery of iron ore deposits in the southeastern portion of Case county, this State, may result in incalculable benefit to Omaha, and this entire section of the country. The samples brought to this city show 70 per cent. of pure iron, and the deposit is said to be inexhaustible. Should the ore prove of quality, and be found in sufficient quantity to justify working, the saving in freight would alone render the discovery a veritable bonanza. It is understood that a company is now being formed for purposes of development, and better and fuller returns may be looked for at an early day.—[Western Merchant, Omaha.

INDUSTRIAL SUMMARY.

New Enterprises:—

The Moore Structural Iron Works, at Grand Rivers, Ky., has been incorporated with a capital stock of $150,000

The Great Northern Iron & Steel Co., capital $2,000,000, have filed articles of incorporation at Duluth, Minn.

The J. N. Sarborough Manufacturing Co., of Americus, Ga., will be organized with a capital stock of $100,000, to manufacture automatic car brakes.

The Detroit Plumbers' Supply Co. has been organized at Detroit, Mich., with a capital of $20,000, to manufacture plumbers' goods and sanitary specialties.

The Cavener Railway Power Transmission & Brake Co., Chicago, has been incorporated; to manufacture railway appliances; capital, $200,000; incorporators, Alexander R. Cavener, Thomas R. Freeman and Harry C. Whitehead.

The American Steel Post & Pole Co., Chicago, is a new concern which has been formed to manufacture and sell steel and metal poles of all kinds; capital, $100,000; incorporators, Thomas J. Thorp, Thomas Bennett, William H. Herrick.

The Columbia Steel Car Co. has purchased a site for the erection of a plant for the manufacture of steel cars. It lies in the town of Maine, about 14 miles northwest of Chicago, and is located between the Northwestern and Wisconsin Central railroads.

The Belding Motor & Manufacturing Co. has secured ten acres for a site in the manufacturing district between the Cragin and Pacific Junction, extreme northwestern portion of Chicago, at the reported cost of $67,000. Three or four hundred men are to be employed.

A $100,000 stock company to start a plumbers' supply factory has been incorporated at Bessemer as the Alabama Pipe Co., by F. H. West, of Bessemer; D. McK. Sinclair and A. F. Bridge, of Whitewater, Wis., and others. It proposes to manufacture soil pipe, plumbers' supplies and wrought iron ware.

Ground has been broken at Ticonderoga, N. Y., for the erection of a large plant for the manufacture of a hot air engine, invented by Woodbury, Merrill, Patten & Woodbury, of South Boston, Mass. The building now being erected is 148x80 feet, and will be followed by a large number of smaller buildings.

A gentleman of large means and ability came to this city [New Birmingham, Tex.] recently to look out a point for a rolling mill. We are informed that he has made satisfactory arrangements, and will put up an extensive plant between this city and Rusk, about 800 yards from either city.—[New Birmingham Times.

The Radford *Enterprise*, of Radford, Va., reports that a company has been organized and chartered for the purpose of manufacturing iron pipe and conducting a general foundry business at Radford. The company starts off with an actual cash capital of $300,000 and proposes to commence at once the construction of a plant which, when completed, will be capable of consuming 100 tons of iron per day, and employing 300 men. The following is a list of the officers of the company: President, James N. Gamble; Vice-President, W. C. DeArmond; Secretary and Treasurer, Archer Brown; General Manager, J. K. Dimmick.

Enlargements, Additions, Removals, Etc.:—

The spike mill of the Midway Iron Co., Roanoke, Va., is almost completed, and work will probably begin within 30 days.

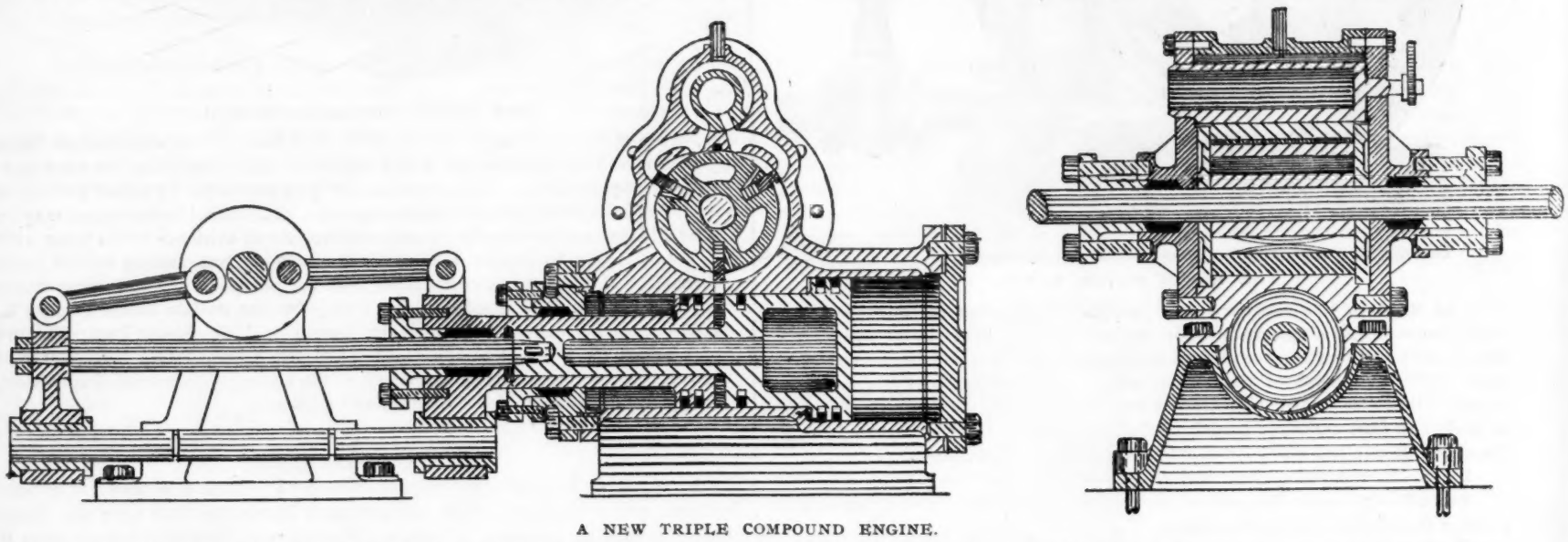
The Phœnix Iron Works, Cleveland, are compelled to extend their capacity. They will, in a few days, determine on location, and proceed to erect extensive works.

The iron foundry and plow works of the C. P. McWane Plow & Foundry Co., have been purchased by the Graham Land & Improvement Co. and will be removed to Graham, Tex.

The A. Plamondon Manufacturing Co., has purchased 10½ acres in the western part of Chicago, on which it proposes to erect works for the manufacture of pulleys, shafting, etc.

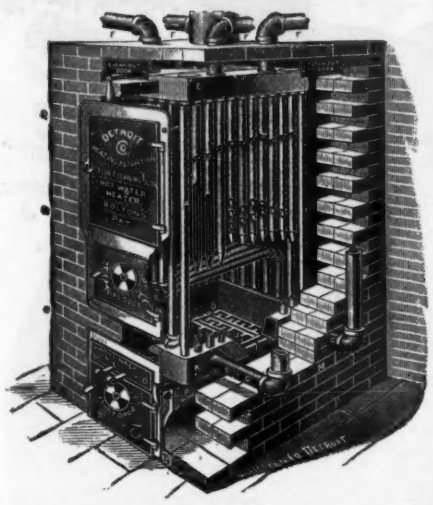
Westinghouse, Church, Kerr & Co. have purchased the old Cragin plant in the northwestern part of Chicago, and will refit the factories, employing about 100 men in the manufacture of engines.

Last week a charter was granted to the Pittsburgh Malleable Iron Co., Pittsburgh, Pa., to operate with a capital of $25,000. The directors are



A NEW TRIPLE COMPOUND ENGINE.

BOLTON



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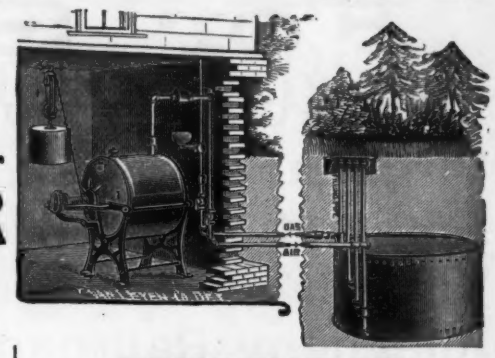

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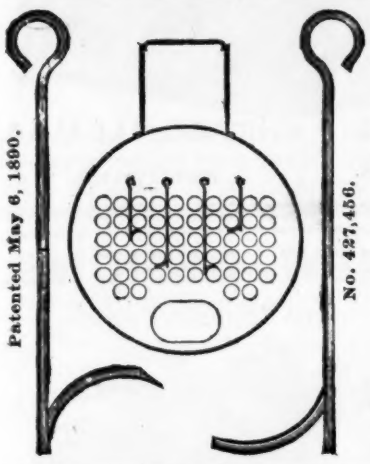

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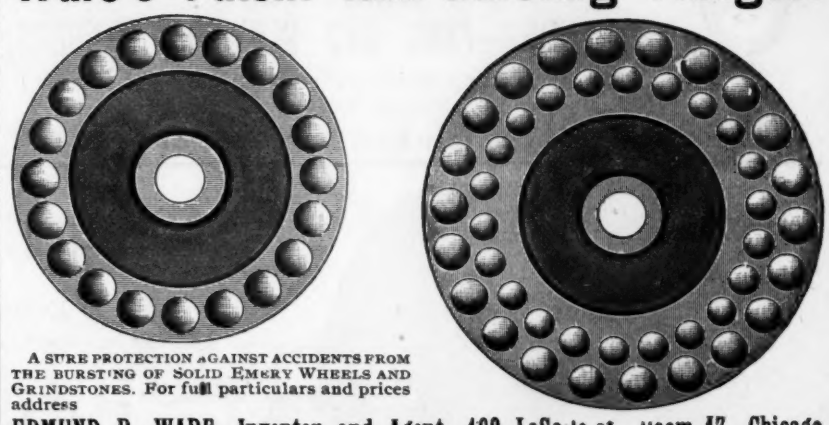

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Frank Moore, T. R. McGinley, George Rollins, F. W. Seimon and F. B. Atterbury.

The Elliott Frog & Switch Co., East St. Louis, has purchased two blocks of land in the Aimes tract, and it is said they will erect new and extensive works in the Spring on the property in question.

Since the successful production of basic steel by the Southern Iron Co., of Chattanooga, Tenn., it is reported that they will put in a steel plant at Rockwood, Tenn., that will be the largest in the South.

The Pullman Palace Car Co., of Pullman, Ill., are completing arrangements for the erection of a repair shop at a cost of $250,000. The building will be 500x500 feet, two stories high, and will be thoroughly equipped in every respect.

Immense new shops are being built at Buffalo, N. Y., for the Lake Erie Engineering Works. The plans provide for a machine shop, built on the gallery plan, to be 250 feet wide, and 112 feet deep. The foundry will be 230 feet wide and 112 feet deep. The machine shop is to be enclosed about December 1st, and the foundry about January 1st, both shops to be ready for business by April 1st, when 500 hands will be given steady employment. The buildings alone will cost $110,000, exclusive of the ground, and with machinery complete will cost $300,000.

Furnaces and Works Starting Up:—

The plate department at the Jefferson Iron Works, at Steubenville, O., which was destroyed by fire a few weeks ago, will be ready to resume in a few days. Work has been begun on the rebuilding of the nail factory destroyed at the same time.

The furnace of the Pulaski Iron Co., at Pulaski City, Va., has been lighted after 60 days of idleness. Thorough repairs have been made throughout the entire plant—the furnace relined, the machinery repaired and improved, a new Spearman gas valve put in, and other important modifications effected.

The Illinois Steel Co. will, early next month, blow in three large blast furnaces at its South Chicago works. These furnaces are 21x85 feet in size, and of 300 tons capacity each. One additional furnace is in course of construction. The offices of the company have been moved to a building just completed. This structure is of brown pressed brick and Bedford stone, fireproof, and cost $50,000. Its companion building, the new laboratory, is nearly ready for occupation. These buildings are located on the Strand facing the works.

Fires and Accidents:—

A fire in the casting-room of the Union Iron Works, Portland, Ore., recently destroyed property valued at $47,000.

The Pillows & Hersys rolling mills, at Montreal, were recently destroyed by fire. The nail works were not damaged, but will be compelled to shut down, as supplies were drawn from the rolling mill. The loss is $80,000, insured, and 300 men are thrown out of employment.

A portion of the shops of the Cincinnati Southern railway at Ludlow, Ky., burned on the 16th. One machine shop, one foundry, one paint shop, two Pullman sleepers, one Mann boudoir car, and two box cars were destroyed. An estimate of the entire loss is $65,000. The fire started from play fires built by boys near the shops.

General Industrial Notes:—

R. H. Cobb is reported as having purchased the Murray & Stevenson foundry at Anniston, Ala.

Geo. Barkman, who has opened an architect office at 908 Main street, Richmond, Ind., would be pleased to receive samples and catalogues pertaining to the building trades.

Several car loads of machinery, principally blast furnace engines, were consigned the other day from Witherow's Machine Shops, at New Castle, Pa., to Florence, Ala., and Bristol, Tenn.

The rolling mill department of the United States Rolling Stock Co., at Anniston has completed a piece of shafting 25 feet long, 7½ inches in diameter and weighs 3,650 pounds. It was to be used in the works at Anniston, Ala.

H. E. Collins & Co., the Pittsburgh agents for the Monarch magnetic separator, have removed their office from the Lewis Block to more convenient and suitable quarters in the new Bank of Commerce building, corner of Wood street and Sixth avenue.

Carnegie, Phipps & Co.'s rod mill at Beaver Falls, went ahead of its previous best record with 205,000 pounds of finished rods during a single day's turn. The nail mill of the plant also made its biggest record on the same day by turning out 1,722 kegs of finished nails on 112 machines.

M. J. O'Donnell & Co., 38 Columbus street, Cleveland, manufacturers of elevators, is a new concern which started up last March, and they report that they have far exceeded their expectations in the amount of business done. They closed three contracts at Columbus, O., last week. The works are run to their full capacity, and the outlook is good.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 19th day of November, 1890, for all the labor and materials required to furnish and fix in place complete the low pressure, return circulation, steam heating and ventilating apparatus, and to complete the plumbing of the United States Court House, Post Office, etc., building at Winona, Minn.

How's This?

The excursions to Middlesborough, Kentucky, and Cumberland Gap, November 7 and 8, account of the great auction land sale of the Middlesborough Town Co., will go via the Mount Vernon & Pan Handle Route, at the low rate of one fare for the round trip, tickets good returning 15 days. It is expected that arrangements will be made to run Pullman palace sleeping cars through without change to accommodate people from Cleveland and vicinity. Address or call on the undersigned for illustrated pamphlet and full information, and remember the dates and route. C. L. Kimball, Ass't. Gen. Pass'r. Agent, 101 St. Clair street.

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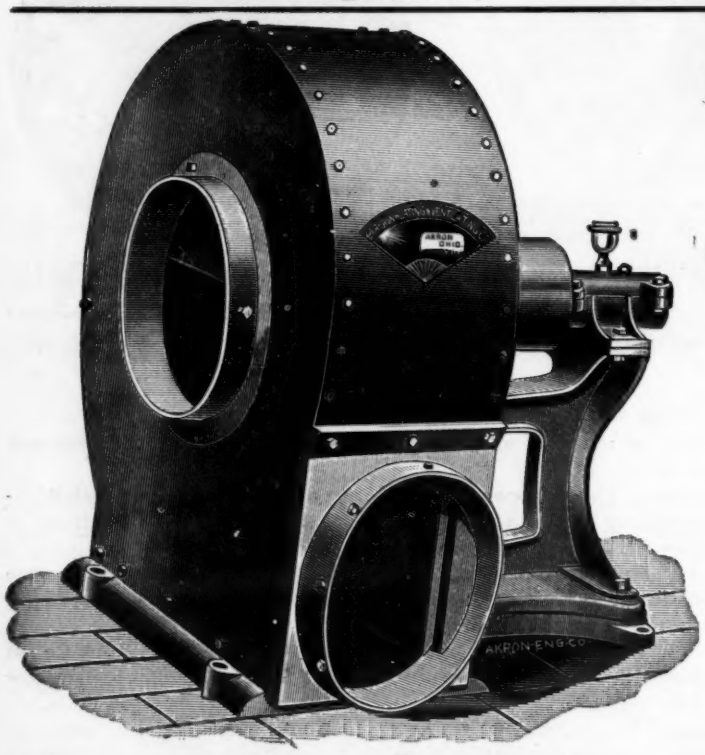

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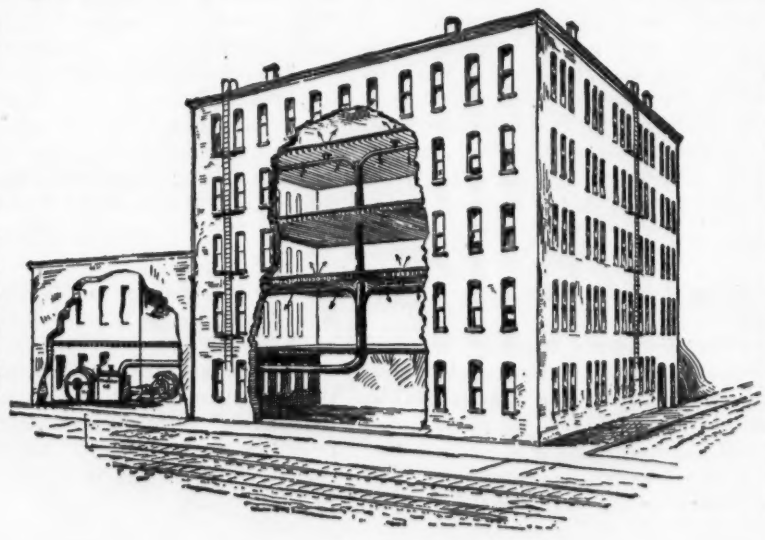

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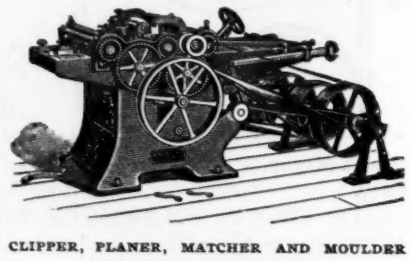

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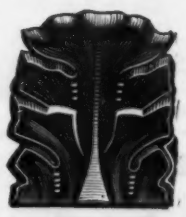

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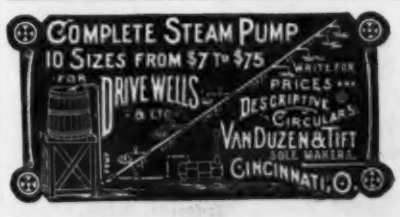

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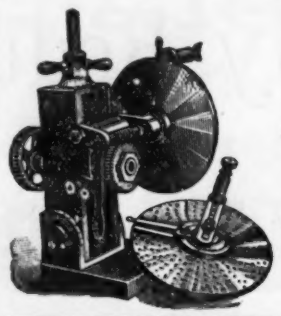

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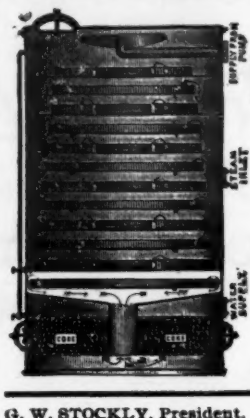

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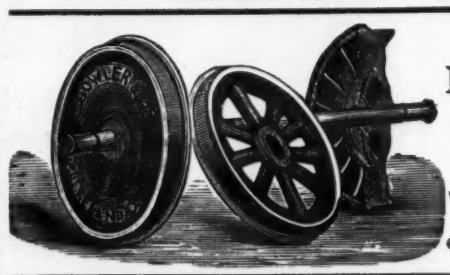

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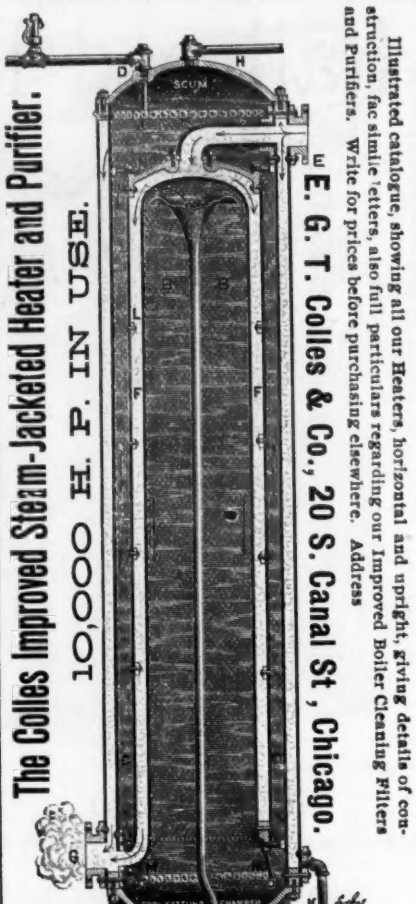
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CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1 foundry, $16 25 @17 00; Southern Coke No. 2 Foundry, $15 75 @16 50; Southern Coke No. 3 Foundry, $15 25 @16 00; Southern Coke No 1, Softeners, $15 75 @16 50; Southern Coke No. 2, Softeners, $14 75 @15 50; Ohio Silveries No. 1, $18 00@18 75; Ohio Silveries No. 2, $17 00@ 17 75; Ohio Strong Softeners No. 1, $19 00@19 50; Ohio Strong Softeners No. 2, $18 25@18 75; Lake Superior Charcoal Nos. 1 to 6, $20 00@21 00; Tennessee Charcoal No. 1, $19 00@20 00; Tennessee Charcoal No. 2, $18 50@19 50; Southern Standard Car Wheel, $22 00@24 50; Tennessee Standard Car Wheel, $19 50@20 50.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 25@ 5 75; Hanging Rock Coke, No. 1 foundry, $17 50@18 00; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 50; Tennessee Charcoal, No. 1 foundry, $ 7 50@18 50; Hanging Rock Charcoal, No. 1 foundry, $21 00 @22 00. MILL IRONS—Standard Southern Coke, grey forge, $13 25@13 75; Standard Southern Coke, mottled $13 00@13 00; Cold Short Southern Coke, grey forge, $13 00@13 50; Strong Ohio Neutral Coke, grey forge, $15 50@16 00. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $22 50@23 00; Tennessee Car Wheel, $20 50@21 50; Lake Superior Car Wheel, $21 50@22 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $17 75@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $16 75 @00 00; Ohio Softener No. 1, $17 75@00 00; Ohio Softener No. 2, $16 75@ 00 00; Jackson Co. Silveries, $18 00@19 00; Lake Superior Charcoal, $20 00@00 00; Tennessee Charcoal, $19 00@00 00; Southern Softener No. 1, $16 70@00 00; Southern Softener No. 2, $15 75@00 00; Southern Strong No. 1 Foundry, $17 75@00 00; Southern Strong No. 2 Foundry, $16 75@00 00; Alabama Car Wheel, $24 00@00 00; Hanging Rock Charcoal, $23 00@24 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $15 00@15 25; Southern coke No. 2, $14 25@14 50; Southern coke No. 3, $14 00@14 25; Mahoning Valley (Lake ore mixtures), $17 75@18 75; Southern charcoal, No. 1, $17 00@17 50; Southern charcoal, No. 2, $16 50@17 00; Missouri charcoal, No. 1, $18 00@18 50; Missouri charcoal, No. 2, $17 00@17 50. FORGE—Neutral coke, $13 75@14 00; Cold short, $13 75@14 00; Mottled, $12 75@13 25. CAR WHEEL AND MALLEABLE—Southern (standard brands), $22 00@ 23 00; Southern (other brands), $18 00@19 00; Lake Superior, $22 50@23 00.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 75@16 25; Southern Coke No. 2, $14 75@15 25; Southern Coke No. 3, $14 25@14 75; Southern Grey Forge, $13 75@ 14 25; Southern Charcoal No. 1, $17 50@18 00; Southern Charcoal No. 2, $17 00@17 50; Missouri Charcoal No. 1, $16 00@16 50; Missouri Charcoal No. 2, $15 50@16 00; Ohio Softeners, $18 00@ 19 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $21 75@22 25; Southern, $19 00@ 22 50. CONNELLSVILLE COKE—East St. Louis, $5 65; St. Louis, $5 80.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $20 00@20 50; Lake Superior (coke) Bessemer, $18 50@18 75; Katahdin (Maine charcoal), $23 50 @24 00; Lake Superior Coke, Foundry, all ore, $18 50@19 50; Lake Superior Coke, Foundry Cinder Mixed, $00 00@00 00; Standard Ohio Black Band, $18 25@18 75; Southern No. 1, $16 50@17 00; Southern Gray Forge, $14 50@ 15 00; Jackson County (Ohio) Silvery, $19 00@ 10 50 Old Car Wheel, $00 00@00 00. Connellsville Coke, $1 80.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 75@ 15 25; Southern Coke No. 2 Foundry $14 25@ 14 75; Southern Coke No. 3 Foundry $13 75@ 14 25; Grey Forge, $13 25@13 75; Southern Coke Silver Grey, $14 00@15 00; Southern Charcoal No. 1 Foundry, $17 50@18 50; Southern Car Wheel, Standard brands, $22 50@23 50.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 00@17 25; No. 2 Foundry, $16 00@16 25; Grey Forge, $15 00@15 25; White and Mottled, $14 00@14 25; Warm Blast Charcoal, $19 00@22 00; Cold Blast Charcoal $24 00 @29 00; Bessemer, $17 50@17 75.

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1½ to 4 by ⅜ to 1 inch	1 95
4½ to 6 by ⅜ to 1 inch	2 05
1¾ to 6 by 1¼ to 2 inch	2 35
1¾ & 1¾ by ⅜ to ¾ inch	2 05
1 & 1¼ by ⅜ to ¾ inch	2 15
⅛, ¼ and ⅜ by ⅜ to ⅝ inch	2 35

Round and Square.

1 to 1⅜ inch	1 95
2 to 2⅜ inch	2 15
2¾ to 3¼ inch	2 45
3⅜ to 4 inch	2 95
4¼ to 4½ inch	3 45
4¾ to 5 inch	3 65

Oval.

⅜ to 1¼ inch	2 35
⅜ to ¾ inch	2 55
½	2 75
⅝	3 15

Half Oval and Half Round.

1¾ to 3 inch	3 05
⅜ to 1¼ inch	2 65
⅜ to ¾ inch	3 25
½	3 45
⅝	4 95

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	2 15
1 to 1¾ by ¼ and 5-16 inch	2 25
⅜ to ⅝ by ⅛ and 5-16 inch	2 45
⅜ to ⅝ by ¼ and 5-16 inch	2 95

Hoops.

1¼ to 4, Nos. 13 to 15	2 75
1¼ to 2, Nos. 16 to 18	2 85
1¼ to 2, No. 19	2 95
1¼ to 2, No. 20	3 05
1¼ to 2, No. 21	3 15
1¼ to 2, No. 22	3 25
15-16, 1 and 1¼, Nos. 13 to 15	2 95
15-16, 1 and 1¼, Nos. 16 to 18	3 05
15-16, 1 and 1¼, Nos. 19 and 20	3 15
15-16, 1 and 1¼, No. 21	3 25
15-16, 1 and 1¼, No. 22	3 35
⅞, Nos. 13 to 15	3 15
⅞, Nos. 16 to 18	3 25
⅞, Nos. 19 and 20	3 35
⅞, No. 21	3 45
⅞, No. 22	3 55
13-16, Nos. 13 to 15	3 35
13-16, Nos. 16 to 18	3 45
13-16, Nos. 19 and 20	3 55
13-16, No. 21	3 65
13-16, No. 22	3 75
¾, Nos. 13 to 15	3 45
¾, Nos. 16 to 18	3 65
¾, Nos. 19 and 20	3 75
¾, No. 21	3 85
¾, No. 22	3 95
11-16, Nos. 13 to 15	3 65
11-16, Nos. 16 to 18	3 85
11-16, Nos. 19 and 20	3 95
11-16, No. 21	4 05
11-16, No. 22	4 15
⅝, Nos. 13 to 15	3 95
⅝, Nos. 16 to 18	4 15
⅝, Nos. 19 and 20	4 25
⅝, No. 21	4 35
⅝, No. 22	4 45
⅝, No. 23	4 65

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 35
1¼ to 6 by Nos. 11 and 12	2 45
1 to 1¾ by ⅛ to 3-16 in	2 55
1 to 1¾ by Nos. 11 and 12	2 65
⅞ and 13-16 by ⅛ to 3-16 in	2 85
⅞ and 3-16 by Nos. 11 and 12	2 95
¾ and 11-16 by ⅛ to 3-16 in	3 15
¾ and 11-16 by Nos. 11 and 12	3 25
⅝ and 9-16 by ⅛ to 3-16 in	3 45
⅝ and 9-16 by Nos. 11 and 12	3 55
½ by ⅛ to 3-16 in	3 75
½ by Nos. 11 and 12	3 85

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 95
⅞ inch, " " " 13 and 14	3 15
¾ inch, " " " 11 and 12	3 25
¾ inch, " " " 13 and 14	3 45

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 80
No. 18 to 21	3 00
No. 22 to 24	3 20
No. 25 to 26	3 35
No. 27	3 45
No. 28	3 55

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 80
C No. 1, " "	3 05
C H No. 1 " "	3 30
C H Flange, " "	4 05
Extra Flange, "	4 55
Solid Fire Box "	5 30

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Tank	3 00
Shell	3 40
Flange	3 70
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3-6 in	14

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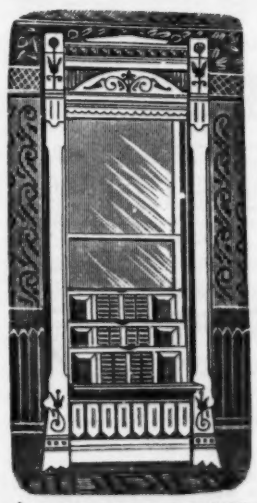

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Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¼".....dis 50&10
Morse Taper and Straight shank Larger than 1¼".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, C. F. F. F.
Kegs, ₩ lb	4 c	5 c	2½c
¼ kegs ₩ lb	4½c	5½c	2¾c
⅛ kegs ₩ lb	4½c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans, less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@55 &5

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅜	11⅛	8⅛	6	5⅛	5¼	5
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate
{ Car lots.....$2.30
{ Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¼ inch and over.....₩ lb 15¼
Sisal, ¼ inch and over.....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls	21c@29c	
No. 18 " " ¼ and ⅛ "	18c@28c	
No. 36 " " ¼ and ⅛ "	16c@27c	
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12½c	
3-Ply " 1¼ lb Balls	11@11¼c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30

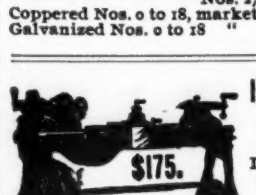
Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " ".....dis 65&5
Tinned market Nos. 0 to 18.....dis 67¼
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 3

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40



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WM. M. MONROE,
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Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $8 00
Others.....℔ doz $7 00
Full polished.....℔ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&10&7
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&5
Loose joint, jap.....dis 70&5
Loose joint, jap. with acorns.....dis 70&5
Loose pin, acorns.....dis 70&5
Loose pin, japanned acorns.....dis 70&5
Loose pin, acorns, jap. plated tips.....dis 70&5
Wrought steel—
Wrought, fast joint, narrow.....dis 70&5
Wrought, fast joint, broad.....dis 70&5
Wrought, loose joint, broad.....dis 70&5
Table Butts, back flaps, etc.....dis 70&5
Regular inside blind.....dis 70&5
Light inside blind.....dis 70&5
Loose pin.....dis 70&5
Light loose pin.....dis 70&5

Carbonized Felt and Building Papers.

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No. 1—Slaters'.....	$1.25
"A," Stringed Roofing, Light.....	1.50
"B," Stringed Roofing, Medium.....	1.75
"C," Stringed Roofing, Heavy.....	2 00
Stringed, Rosin-Sized.....	1.00

MILCELLANEOUS.

Asphaltum, Trinidad Refined, ℔ ton.....	$30 00
Asphaltum, Fine Grade, ℔ lb.....	.08
Coal Tar Felt, 1 Ply, ℔ lb.....	.02
Coal Tar Felt, 2 Ply, ℔ roll 108 sq ft.....	1 42½
Coal Tar Felt, 3 Ply, ℔ roll 108 sq ft.....	1.85
Roofing Pitch, ℔ gal.....	.09

Chains.

Revised List.

Trace, 6¼-10-2.....℔ pair 1.03
Trace, 6¼-10-3.....℔ pair .92 } .....50&10
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....℔ lb 5¼@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt.....	$4 00	$4 50	$.....
Dairy, 14 qt.....	4 50	5 00	.....
Fire 12 qt.....	5 00	.....	.....
Sugar.....	6 00	6 50	.....
Horse.....	.....	5 00	.....
Buggy.....	4 00	.....	.....
Chamber } 5 and 5X Slop } 14 qt. Commode }	6 50	7 50	8 50
Jars, slop, 5 and 5X 14 qt.....	8 00	9 00	10 00
Basins, wash—			
10½ inch.....	2 00	2 25	.....
12 inch.....	2 25	2 75	3 25
13½ inch.....	2 75	3 25	3 75
15 inch.....	3 25	3 75	4 25
Bowls, fruit.....	.....	2 50	.....
Servers, 12 in.....	.....	2 25	.....
Baskets, waste paper, 13 in.....	.....	6 00	.....
Spittons, "Daisy," pressed 8 inch.....	4 00	4 50	5 00
10 and 11¼ inch.....	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 50&10
Richard's.....dis 30@30&10

Horse Nails.

	No. 10	9	8	7	6	
Ausable, ℔ lb..	23	24	25	26	28	dis 40
Putnam, ℔ lb..	18	19	20	21	23	dis 15

Essex.....dis 25&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 70&10
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....℔ doz $6 00
Bishop's O K.....℔ doz $5 25
Bishop's Pioneer.....℔ doz $3 75
Bishop's American.....℔ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@[illegible]...dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....℔ gross $15 00

Scales.

Hatch, Counter, No. 171.....℔ doz $21 00
Hatch, Tea, No. 161.....℔ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1883.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....℔ doz $18 dis 25

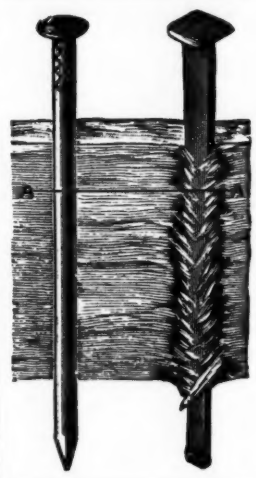
Squares.

Steel and iron..... } dis 75&10@80
Nickel plated..... }
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.

American iron carpet tacks all kinds.....dis 70&10&10
Steel carpet tacks all kinds.....dis 70&10&10
Swedes iron carpet tacks, all kinds.....dis 70&10&10
Swedes iron tacks.....dis 70&10&10
Swedes iron Upholsterers' tacks..dis 70&10&10
Tinned Swedes iron tacks.....dis 70&10@10
Tinned Swedes iron Upholsterers' tacks.....dis 70&10&10
American iron cut tacks.....dis 67½&10&10
Copper tacks.....dis 50
Copper finishing and trunk nails.....dis 50&00
Cigar box nails.....dis 45&10
Finishing nails.....dis 6
Hungarian nails and miners' tacks.dis 62½&5
Gimp and lace tacks.....dis 70&5
" " " tinned.....dis 66&10
Trunk and clout nails.....dis 66⅔
Tinned trunk&clout nails.....dis 66&10&10
Basket nails.....dis 66&10&10
Chair nails.....dis 66&10&10
Common and patent brads.....dis 66&10&10



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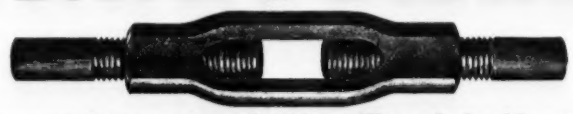

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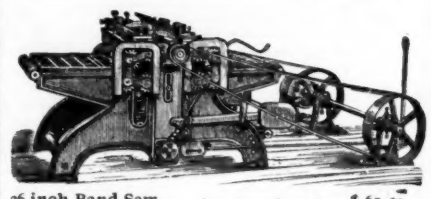

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Pittsburgh Express.....	†1 20 p m	11 10 p m
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*Daily. †Daily, except Sunday. ‡Daily except Monday.

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(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
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	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	7 45 a m	12 50 p m
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	*11 10 p m	.....
Alliance Accom.....	3 25 p m	10 10 a m
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From Cleveland Union Station.

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	d 8 00 p m	5 40 p m
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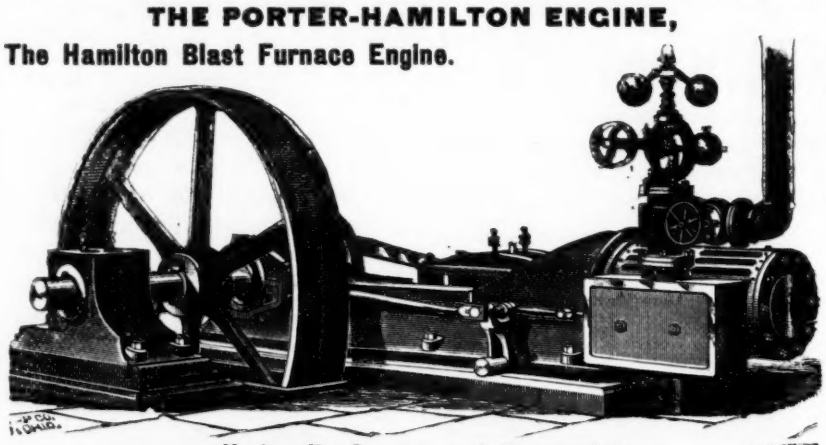

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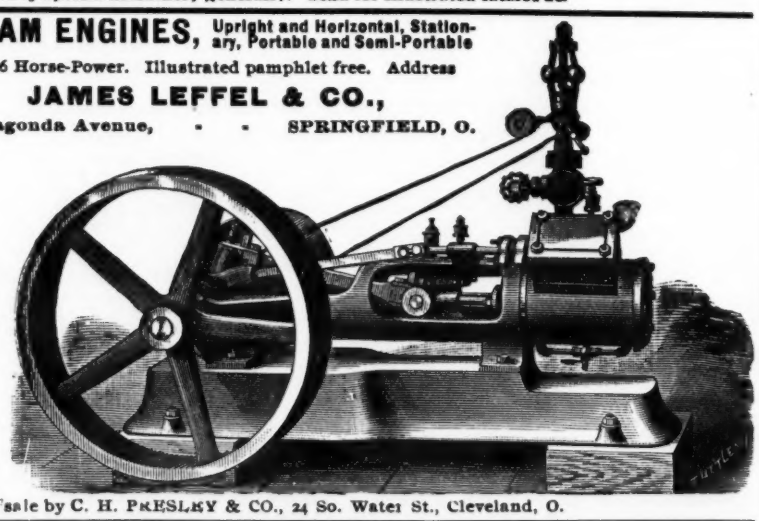

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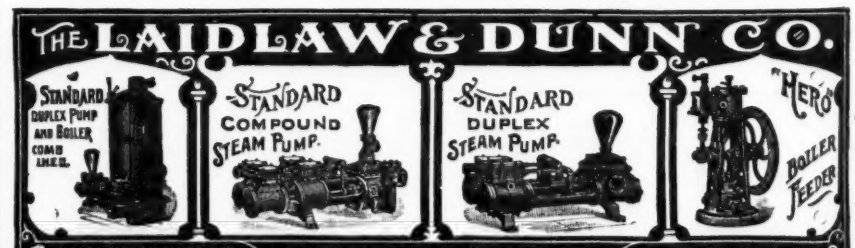

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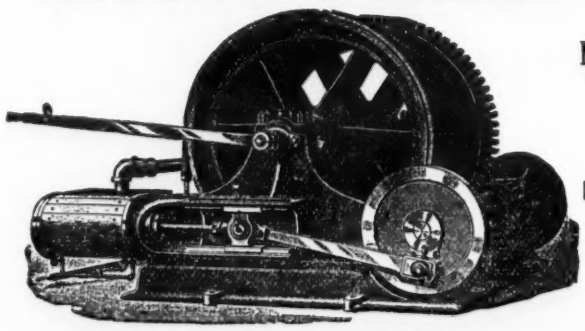

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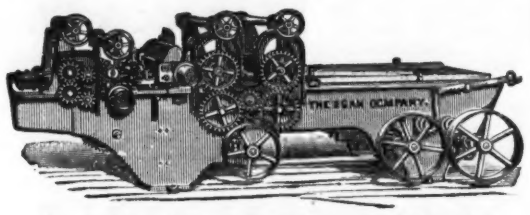

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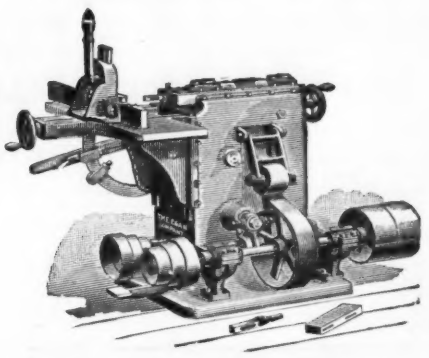

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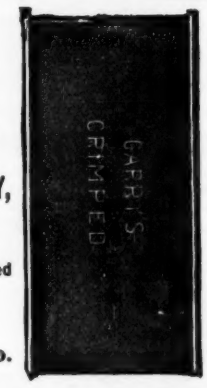

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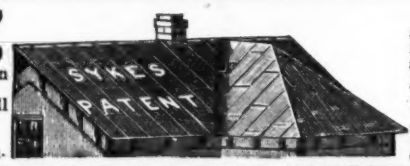

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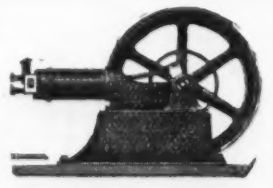

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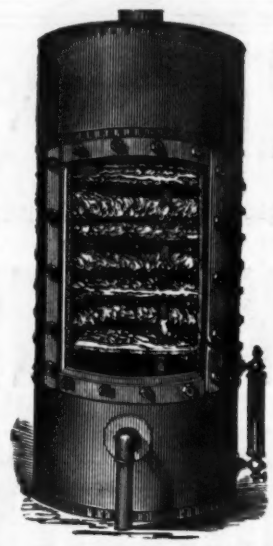

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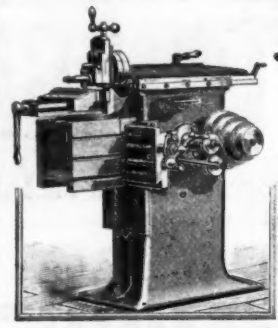

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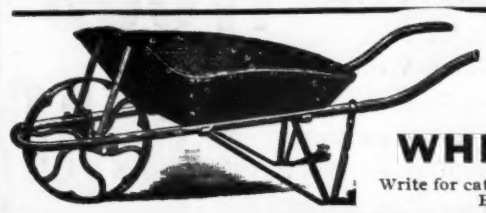

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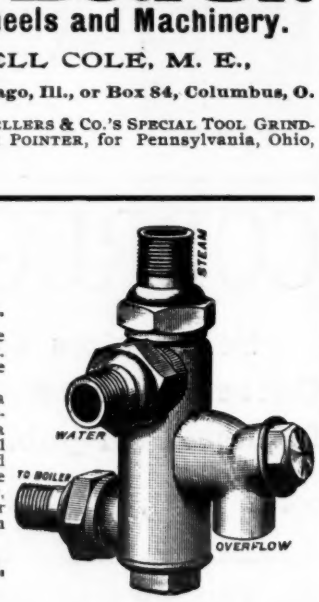

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